



47380 June 1987 \$2.95
Canada \$3.75

Radio Control CAR ACTION

THE WORLD'S PREMIER R/C CAR MAGAZINE



MRC PORSCHE 959



**AIRTRONICS
SR-2P
Radio**

**PROJECT
FROG**



**Turbo
Charged!**

**Steering
Linkages**

**Mounting Lexan
Bodies**



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Volume 2, Number 3
June 1987

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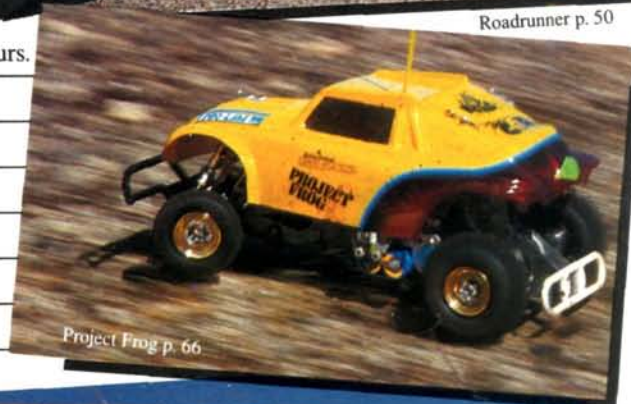
On the Cover: MRC gets top billing this issue with two great cars—their new 1/12-scale, four-wheel-drive off-/on-road 959 Porsche that's sure to trigger a new trend! Our feature project car, Frog, is jumpin' off the pages and also getting front coverage is the new SR-2P trigger radio from the R/C wizards at Airtronics.



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Roadrunner p. 50



Project Frog p. 66



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Radio Control CAR ACTION

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SUBSCRIPTION PRICES:

U.S. & Possessions (including APO & FPO):

1 year (6 issues) \$15.95

2 years (12 issues) \$29.95

Outside U.S.:

1 year \$20.95; 2 years \$39.95

Payment must be in U.S. funds.

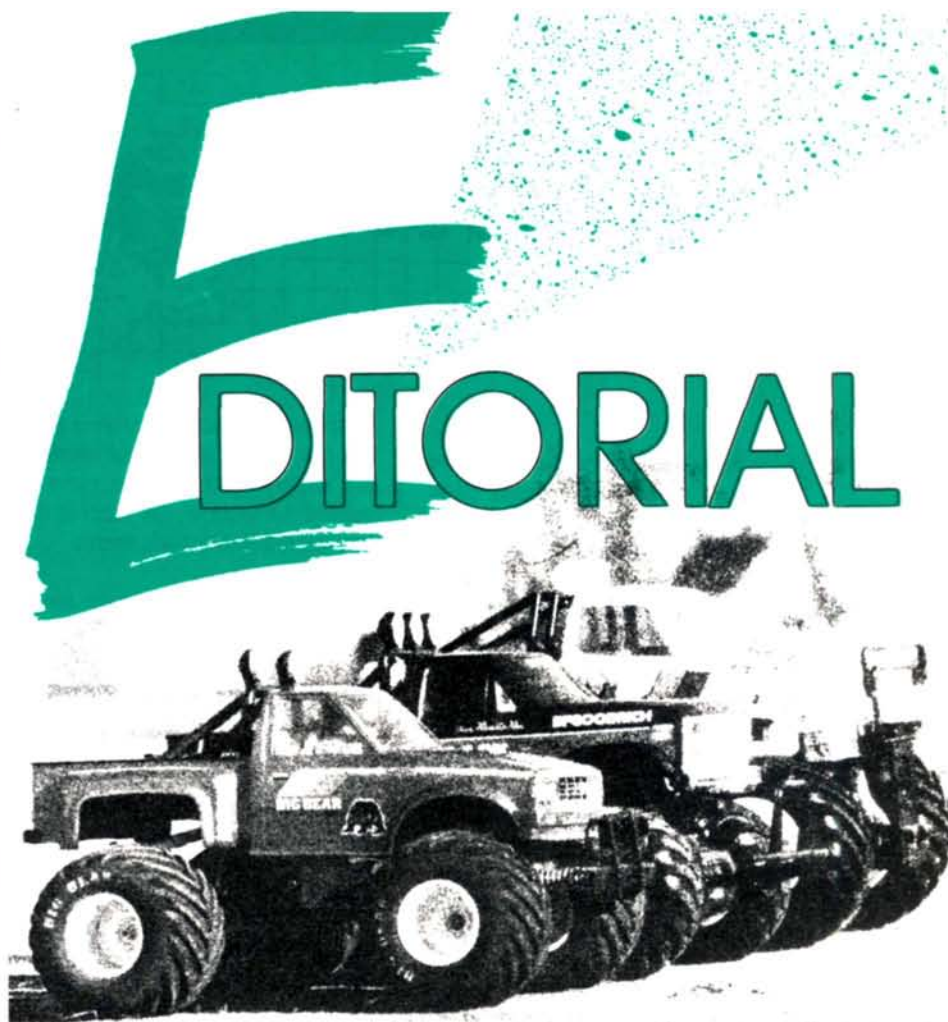
RADIO CONTROL CAR ACTION is published bimonthly by Air Age, Inc., 632 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Office, 632 Danbury Rd., Wilton, CT 06897, phone 203-834-2900. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. Micik, Treasurer. Second Class Postage Permit pending at Wilton, Connecticut, and additional Mailing Office. Copyright 1987 by Air Age, Inc. All rights reserved. ISSN 0026-7295.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Radio Control Car Action* become the exclusive property of Air Age, Inc., unless prior arrangement is made in writing with the Publisher.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to *Radio Control Car Action*, Advertising Dept., Air Age, Inc., 632 Danbury Rd., Wilton, CT 06897, phone 203-834-2900.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to *Radio Control Car Action*, Subscription Dept., P.O. Box 427, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Radio Control Car Action*, P.O. Box 427, Mount Morris, IL 61054.



H by LOUIS V. DeFRANCESCO JR.

AVE WE got an issue for you—plus 16 more pages of fabulous R/C car articles and color track reports. Thanks to you, the R/C modeling enthusiast, our growth has been vertical! This is incentive for us to provide you with the biggest and best R/C car magazine.

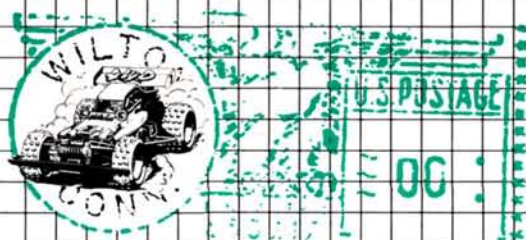
I've decided to feature a few more major race events commencing with the next issue, but this coverage won't be limited to mundane race scores and winners like the R/C racing rags. We'll be giving you inside information on the products and building techniques the winners employ so you can improve your car's performance and track times!

We've received many letters asking about the correct way to mount Lexan bodies, so if you turn to page 36 Phil Sroka will show you how it's done. Also in demand are requests for a "Monster Truck Shoot-out," and it begins on page 20. It's our firmest commitment to provide you with just what you want!

We've turned the ever-popular MRC Frog into a dangerous predator in "Project Frog," and speaking of dangerous predators, check out the spiked tires on the nitro-burning Puma. It's a real road warrior.

Another item that attracted a sack of mail was the article called "Building Your Own Quick Charger," which we featured in the February 1987 issue. Apparently many modelers would like to build their own, so we've provided a follow-up article by John Mundy, who incidentally is an accomplished electrical engineer. We have a whole slew of new R/C cars and how-to articles and a whole lot more. When you're hot, YOU'RE HOT! Enjoy!

Letters



R.O.A.R. ?

The following is a letter we received from Mr. Anthony Lubrano of Queens, New York. We've received a number of other letters concerning this matter, some quite colorful. We're printing this one because we feel you the reader should be the judge and that, also, we'd be remiss in letting this get swept under the rug.

My friends and fellow racers, I'm not an alarmist and have been moved to write this letter only after a great deal of thought. I love R/C car racing and most of those involved in the sport, which is why I find it so discouraging and disheartening that the selfish and unsavory human behavior invade upon the joy of our friendly competition. Is there no escape from this evil that plagues us in the outside world! To get right to the point, I'm speaking of R.O.A.R. and, more specifically, of the Products Approval Board. There seems to be a gross conflict of function here. The individuals who hold authority are themselves manufacturers of the very same products up for approval.... How, then, can they possibly be objective?

Case in point: Ernie Provetti is the Chairman of the Motor Approval Committee, and if you're not aware, Mr. Provetti is also Trinity Motors! There are many other such dubious parallels—just look at the names of the individuals on the R.O.A.R. REV-UP official News Letter. In my opinion, the whole thing smells of collusion, a scam. On the one side, we're forced to buy one of the motors approved by R.O.A.R., but they're approved by the very people that in turn manufacture these motors. I'm sure there are other unapproved motors that would meet a technical guideline for approval, but aren't even on the agenda. If I wish to compete, I must select and purchase a R.O.A.R.-approved motor. On the other side, have you noticed how industry-sponsored racers always are in the winner's circle?... Anyone believing that the motors we

unsponsored racers buy over the counter are the same motors that manufacturers are supplying their team racers with, is misled. Of course, the label is the same, but the similarity ends there.

So here we are, the average Joe-unsponsored enthusiast, again receiving the short end of a dual-pronged stick. I think it's only appropriate for more objective individuals to replace the special-interest, self-serving ones. Chances are you'll most likely not print this letter, not wanting to stir the pot, but let me remind you that it's the average-Joe modeler who is the consuming end of the hobby. It is in the best interest of us all to see that the few stacking the cards in their favor aren't allowed to squash the aspirations of the many by making it next to impossible to have fair competition. Many other hobby-related competitions have gone by the wayside because of this selfish phenomenon. Let's not let it happen here with our great hobby.

ANTHONY LUBRANO
Queens, NY

Race Track Questions

About thirty kids, four adults and I are planning to build an R/C off-road race track in my backyard. My yard is four acres of soft dirt with some patches of grass. Some things I'd like information on are: 1) what kind of dirt should be used; 2) what shape should the track be; 3) what's the approximate width and length of a track; 4) how high should jumps be and how deep ravines? Thanks a lot.

HENRY S. TRUMAN
Lafayette, CA

See "Race Track Design" in our Winter '86 issue.

LVD

Oval track Fever

Dear Chris Chianelli,

I'm addressing this letter to you personally because in one of the issues in the past

you said you had a Kyosho Icarus. I want to convert my Icarus to sprint-car ovals or NASCAR-type ovals, or both.

Do you know if any of the sprint car bodies will fit the Icarus? Also, do you know what kind of body mounting kit is needed for the NASCAR-type body? I really like the sprint car on page 49 of the April issue. I'd love to convert my Icarus to look like that.

CHRIS MARTIN
Orlando, FL

Chris, 1/10-scale sprint cars are in my opinion going to be the next boom! As of right now I don't have an answer but have many dirt-oval sprint car articles in the works. I'll research your question and get an answer out to you through the mag just as soon as I can.

CC

Ignored No Longer

I'm fourteen years old and trying to learn all I can about R/C electric cars, but at my age it's hard. Is there any way I can get a hold of some books that someone my age can understand? Is there any way I can get some hands-on training? Who do I learn from? I hope you'll answer, you're my last hope. I've written to other places and been ignored—please write back.

BRIAN PIPER
Salem, MA

You should first try to find others in your area who run R/C cars. Try our "Track Directory" for someone nearby. Also, look in the index of this magazine for The Basics of Radio Control Cars, which can be ordered toll-free. Video Sig also puts out an excellent video called "The Winning Edge With RC-10" featuring the driving strategy of world champ, jammin' Jay Halsey. To order, call (800) 245-6717.

LVD

Mystery Truck

Loved the February issue with the Black-foot and great-looking girls, especially

We welcome your comments, and suggestions. Letters should be addressed to "Letters," *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length. We regret that due to the tremendous amount of letters we receive we cannot respond to every one.

the one in the leopard dress. What car is the girl with the pink shirt and the legs holding on the cover? Keep the girls coming! I read your mags three or four times each.

JOHN SCACLIFF
Pasadena, CA

Whenever I pick up an issue of your mag, I do what every normal person does, check the cover then flip through it, then buy it. I've got the Fall, Winter, and February issues and I'm itchin' to get the April issue. I picked up the February issue when I spotted the lady with the white car and the pink shirt and said to myself, that car's for me. My hobby shop didn't know what it was, though. So, I'm writing you to find out.

SCOTT SUGDEN
Guelph, Canada

It's a Maui Big Bear. LVD

Rocky Parts? (!)

I read an article on the Kyosho Rocky. It got a good review; it was determined affordable so I went ahead and purchased one. I can't get parts for it though! Is there a source you know of?

STEVE ROSENFELT
Orlando, FL

Recently I purchased a Kyosho Rocky four-wheel-drive R/C car at our local hobby store. During our testing period we experienced a problem—can't locate replacement parts.

JAMES AMBRUSIO
Rocksford, IL

Due to the rush during the holiday season, many distributors have been inundated with orders. According to Great Planes, this problem has been rectified. They expect another shipment in early April, so by the time you read this, they'll be unloading the box full of your sought-after parts. LVD

Sprint-car Conversions

I've been running electric R/C cars for almost two years now. I'd first like to say that you've been doing a fine job with the

magazine, which gets better and better! In your April issue I saw a Racers Pit Stop ad in the "What's New" section, and I was wondering if you could run an article on how to convert a normal off-roader into one of these fantastic sprinters. Also, if it's possible I'd like to see some handling tips for dirt-oval racing.

BILL COULTER
Walnut Creek, CA

Hold on to your hat, the sprint-car conversions are in the works. LVD

A Matter of Preference

What a great magazine—it was a relief to see it arrive. I had been reading the off-road section in RCM but that column has been dropped. Your magazine is far superior. I saw a Blackfoot at a hobby shop and I was interested in getting it. I put off buying it until you guys did a track report on it. I finally picked up the latest issue and there it was; thanks. I was shocked to see the article entitled "The Next R/C Dimension." This is a car magazine. I had a car and then a plane and now another car. Planes are not all they're cracked up to be.

JAKE "The Snake" PARTAK
Longmont, CO

Thanks....

Awesome: this is the only way to describe your wonderful magazine. I have recently become involved in radio-control, two weeks before purchasing the January/February issue. The photography, track reports and special articles, like "Project Grasshopper," are all excellent. Thanks, Chris Chianelli, for pointing out the different shock springs on Blackfoot—I was wondering why it sagged in the rear. One problem I have with my "Foot" is that the motor heats up substantially after only running two batteries through it consecutively. The differential is well greased and moves smoothly. Is this natural for all cars, just the Blackfoot, or did I mess up during construction? I have

also purchased and read *The Basics of Radio Control Cars* by your editors and found it an excellent resource to have. I think your magazine is the greatest, but when can I count on getting it on a monthly basis? Thanks!

TONY HAKE
Northglenn, CO

All motors will heat-up to some degree but a motor should never get so hot that you can't touch it. You didn't say whether you're running a rubber dust boot; if so, get rid of it. It's better for both performance and the life of your motor to run a dust cover that breathes. Many companies put out dust covers of sponge, or you can fabricate one yourself from a piece of nylon stocking. Also, you should allow a few minutes of cooling in between batteries. LVD

Inside Scoop

I've just finished reading your April issue. I totally enjoyed your new column "The Inside Scoop." It really fits in what I think is the premium and vastly superior R/C car magazine. My only complaint is having to wait two months for a new issue. Keep throwing those tantalizing tidbits our way! When is the RC-12L going public?

BRUCE BURTON
Spokane, WA

The fiberglass 12L is now available and we'll let you know as soon as the graphite version is ready. Don't worry about the tidbits, they'll keep coming as I get the scoop. CC

When I go to my local hobby shop and look through other R/C mags, I snicker to myself that other less-fortunate modelers must subscribe to that second-rate literature. Your track reports are excellent and your photos are the best. You have a great art department, and I was wondering if they could put in a centerfold of the car of the month.

CODY "Wild Bill" CAST
Albuquerque, NM



The Inside Scoop

by CHRIS CHIANELLI

THE R/C car industry is in a fast-pace state of advancement with new products being offered at a head-spinning rate. The number of choices from entry level to all-out competition equipment is ever-increasing. In light of this phenomenon, I'll make the manufacturers nervous and you R/C squirrels who are hungry for info happy by bringing you a special report on security leaks and "late-in" items in the new "Inside Scoop."



REMEMBER THE days of the 1/24-scale slot car? Well, take a look at the above picture—looks like an indoor slot car track without the slots! The Tamtech concept is going to break all space and size constraints formally imposed on 1/12- and 1/10-scale R/C car racing. Don't be at all surprised if the remaining slot tracks resurface their old tracks, making them slotless in order to update for the oncoming trend! As you can see, the possibilities of track design are endless.

THEY'RE HERE! Radio-control tractor-trailer trucks from Model Maker of England. And they're beautiful. Names like Kenworth, Freightliner and Mercedes are just a few in this line and a variety of accessories, naturally, will be offered. Watch for them, they're a caravan of many wheels coming soon!

NEVER MISS an opportunity, that seems to be Parma's motto. An anonymous spy has informed me that Parma is doing extensive research on their own 1/24-scale racer, code-named Bobcat. Parma seems

to have a magic cornucopia of new products. It's no surprise to see the introduction of a classic, namely a 1/10-scale '57 Chevy. Watch for it.

NEW SIGHTING reported on the Mammoth from Polk's Hobbies, the people who brought you the ready-to-race two- and four-wheel-drive Kangaroos. They're readying their new Mammoth Monster Truck even now as you read this, and it will be unleashed soon. This monster will feature oil-filled coil-overs, planetary gear differentials at both ends and a new reduction box to handle the 5-inch-plus tires. Sounds like a monster mud-mix-master to me!

AN MRC/TAMIYA top-level informant has leaked the existence of an all-new two-wheel-drive offering called the Striker. All I can say at this point is that four coil-overs and some type of Indy or CanAm body will be featured. In the source's own words, "It's designed to strike your fancy, not your pocketbook."

RUMOR HAS IT that there is an important Japanese manufacturer that will be introducing a whole new line of race-ready R/C cars in 1/12 scale. We hear that these are so advanced that they're going to shake the R/C tree from the top branches! And speaking of shaking the industry, my most reliable source has brought me news of a new stock electric motor that's being produced in Taiwan, a motor that he claims will be light years ahead of any other—and it will be priced at under \$15!

LITESPEED R/C Performance Products of Spokane, Washington, has introduced their new watertight, interlocking parts storage compartments as a premier offering. "By using modern molding methods and innovative thinking, we're able to offer a high-quality product at a reasonable price" said founder Stephen S. Warner. Watch for future releases.

DUE TO THE SUCCESS of the versatile 1/10-scale Tornado, Monogram will be introducing an ultra-sleek deluxe off-road racer called the Brushfire. Monogram is providing a special high-performance package with every "Fire," consisting of eight ball bearings and four adjustable, oil-filled shocks. Extrapolating on the

Tornado, I'd say this car's got to please the performance minded.



FLASH! Tyco, one of the leading manufacturers of HO-scale racing products, has joined the ranks of 1/12-scale Grand Prix with a new ready-to-run Formula 1 car. They've also introduced a four-wheel-drive Turbo Hopper to join the two-wheel-drive Turbo Hopper. Both feature what Tyco calls their "super turbo power."

PACESETTER NOW has the respected name of Heddman manufacturing the tuned pipes for the 1/4-scale enthusiast. Heddman has been supplying the full-scale race circuit with tuned headers for years. The big boys got nothin' on us now!

McALLISTER RACING, the body boys, has introduced yet another aerodynamic anomaly, the new Wedge-Mustang. Will the madness never end?... I see no reason why it should.

Keeping the industry BUGGED, I'll see you next time—or sooner, if I catch you in my spyglass! CC

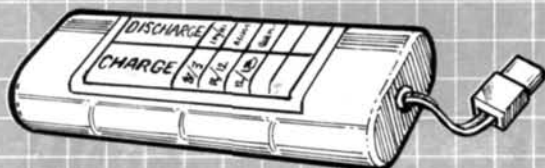
Pit Tips

by JIM NEWMAN



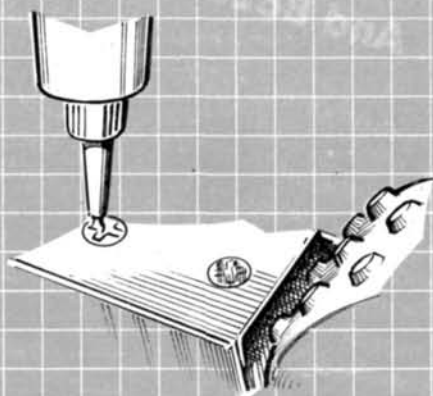
"Cross-country" work has obviously had an adverse effect on this contributor's cars. He strongly recommends waterproofing the receiver, battery pack, and speed controller by sealing them in thin plastic bags. Note how the ends of the plastic bags are firmly bound with small rubber bands, or even cord, so that water doesn't seep down the wires.

Greg Meunier, Ste. Foy, P.Q., Canada



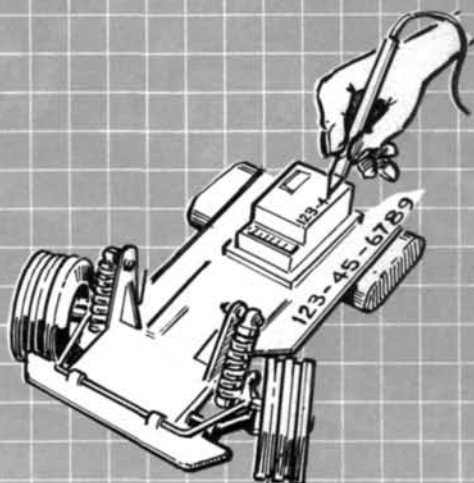
Here is a way to document the life history of your battery packs. Tape a label to each pack and on it record charges, discharges, and capacity/date, etc. If the labels were covered with wide, clear plastic tape, one could use a wipe-off type wax pencil.

Kenji Uematsu, Briarcliff Manor, New York



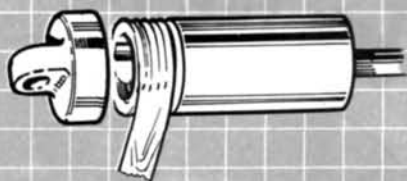
Dirt, clay, etc., tend to clog the recesses of Phillips head screws under the car chassis and in the heat of racing they can be difficult to undo. A large bead of Puffy Paint—the sort used for T-shirts—squeezed into the recesses will keep out the dirt. It can be quickly removed with the point of a knife. We would think that modeling clay would serve the same purpose...even soap, too.

Robert Izuo, Honolulu, Hawaii



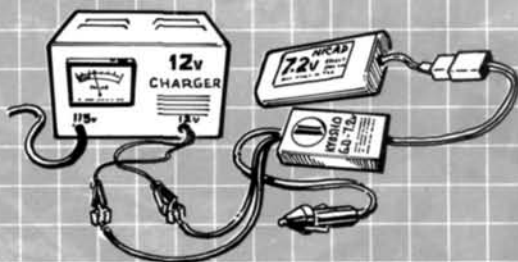
Model cars and their associated equipment are highly portable—perhaps too easily so for some light-fingered gentry. This car owner suggests engraving your Social Security Number on each chassis, receiver, battery pack, etc. This does make it tricky for thieves to dispose of the equipment and certainly helps in identification on recovery.

Michael Englert, Seattle, Washington



Discovering that his shock absorbers leaked oil from around the cap, our correspondent unscrewed each cap, then wound a layer of plumber's Teflon tape around the thread before replacing the cap. This successfully—and cleanly—cured all leaks.

Howard Beringer, Mystic, Connecticut



For bench charging, where a 12-volt source is required, this modeler uses his regular automobile 12-volt charger to provide the 12 volts to his normal plug-into-the-cigarette-lighter charger! Just be careful to observe the normal red to red and black to black polarity of all the leads and be sure all clips are insulated (not shown here), or ruined equipment will surely result.

Mike Roberts, Laurel, Maryland

Radio Control Car Action will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send rough sketch to Jim Newman, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

R/C Electronics

Airtronics

SR-2P



THIS month I have another new pistol-grip radio to review, the Airtronics* SR-2P. The radio as received consisted of a pistol-grip SR-2P transmitter, 92021 receiver, two 635 servos, and accessories consisting of spare horns, servo-mounting hardware, and frequency flag. The operating frequency of the SR-2P provided was the Channel 2, 27.045 MHz, flag color red. The first thing that strikes you about the radio is the man-size pistol-grip transmitter. It measures 7x9x3.6 inches and weighs 1 pound, 4 ounces outfitted with Ni-Cds. Incidentally, the transmitter has a built-in charger jack so Ni-Cds can be used, but the charger is not included in the basic system. Airtronics charger model part no. 95030 will work just fine with the SR-2P.

Let me summarize the highlights of the SR-2P system:

Transmitter—SR-2P

- Unique pistol-grip design.
- Calibrated RF power output meter.
- Trigger-operated throttle with proportional brake trim.
- Wheel-type directional control with trim.
- Safety strap hook.
- Available on all approved 27 and 75 MHz frequencies—Amplitude Modulation (AM).
- Easily changed alkaline battery power.
- Measurements overall: 7x9x3.625 inches.

Advanced engineering, highly functional design.

Servo—SR-2P/635

- Rugged construction, shock resistant.
- Size: 1.54x0.79x1.59 inches.
- Weight: 1.8 ounces.
- Torque: 47 ounce-inches.
- Transit time: 90° in 0.3 sec.
- IC amplifier carbon pots and button wipers for long life.

- Weight, including alkaline cells: 1 pound, 4 ounces.
- Six-element, 36-inch long whip antenna.
- Charging jack for Ni-Cd battery operation is available.
- Ni-Cd pack available.
- Crystal accessible under front panel cover.
- Servo-reversing on both channels.

Receiver—92021

- Small size: 2.0x1.3x0.75 inches.
- Lightweight: 1.0 ounce with crystal.
- Ruggedized shock-resistant construction.
- Externally accessible crystal for rapid changes.
- Standard Airtronics connectors for compatibility with all Airtronics servos and accessories.
- Power required: 4.8 to 6.0 volts: supplied from alkaline or Ni-Cd cells, from speed controller, or from drive motor batteries with proper regulator.
- Short, easily installed 19-inch antenna.

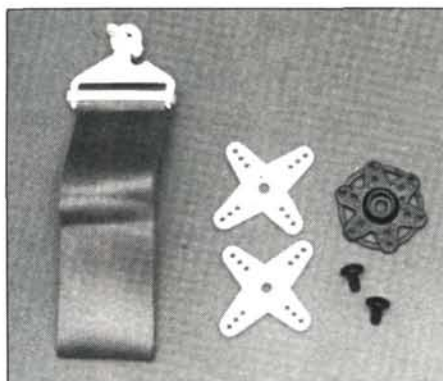
by CHARLIE KENNEY

Let's take a more detailed look at the transmitter. At the top is a six-element 36-inch long retractable antenna. To the right of the antenna and also on the transmitter top are the two servo-reversing switches. As you face the transmitter, the steering servo-reverse switch is to the left and the throttle switch is to the right. Directly ahead of the servo-reversing switches, again on the transmitter top, is the steering trim adjustment. This control is used to make any small corrections required to steer the model on a straight course. The degree of control is about plus-or-minus 15°. In setting up your vehicle, the steering mechanical adjustments should be made with the trim control in neutral so that steering trim control can be effective either side of steering wheel neutral.

Below the upper control positions, we find the front panel controls and accessories. Most prominent is the steering wheel which moves right and



Vehicle unit including receiver, two servos, battery holder, and switch harness.



Accessories include frequency flag and three spare servo horns.

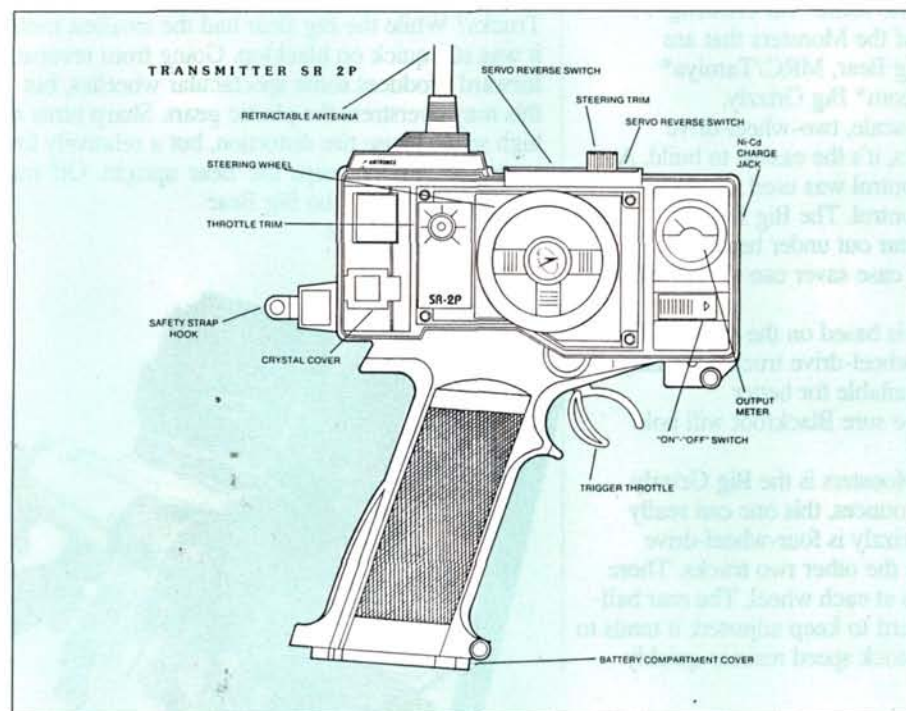
left. Travel in each direction is about 35°. Under the steering wheel is the throttle trigger, which is operated by



Pistol trigger provides both forward and reverse, antenna storage compartment above grip.



Transmitter top view showing servo-reversing switches above steering trim knob.



the index finger and may be squeezed for proportional throttle control or moved in the opposite direction for braking. As I had a prototype of the new SR-2P transmitter, my system did not have the throttle travel adjustment which would allow the trigger throw

(Continued on page 52)

MONSTER TRUCK SHOO

by the RADIO CONTROL CAR ACTION STAFF

ROLLING THUNDER REVIEW



ARE YOU TIRED of the hotshots blowing your doors off on the track? Wouldn't you like to get some revenge? Why not get a Monster Truck and do some "car crushing"?

Let's compare three of the Monsters that are available, the Marui* Big Bear, MRC/Tamiya* Blackfoot, and the Varicom* Big Grizzly.

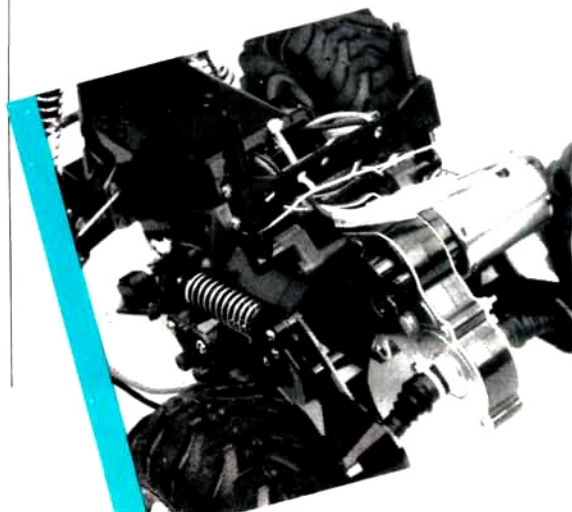
The Big Bear is a 1/12-scale, two-wheel-drive truck. Of the three trucks, it's the easiest to build. A Futaba* MC-8 speed control was used to overcome the weak stock speed control. The Big Bear has plastic gears that can wear out under heavy use. Moores Ideal Products* case saver can reduce wear on the plastic gearbox.

The 1/10-scale Blackfoot is based on the successful Frog chassis. This two-wheel-drive truck has many hop-up parts that are available for better performance. You can be sure Blackfoot will hold up well.

The largest of these Monsters is the Big Grizzly. Weighing 6 pounds, 14 ounces, this one can really flatten a car. The Big Grizzly is four-wheel-drive and more complex than the other two trucks. There are two coil-over shocks at each wheel. The rear ball-bearing differential is hard to keep adjusted; it tends to become too loose. The stock speed resistor quickly

smoked itself.

What was it like driving our three Monster Trucks? While the Big Bear had the smallest motor, it was still quick on blacktop. Going from reverse to forward produces some spectacular wheelies, but this may overstress the plastic gears. Sharp turns at high speed cause tire distortion, but a relatively low center of gravity keeps the Bear upright. Off road the large tires help the Big Bear over the rough spots.



OUT

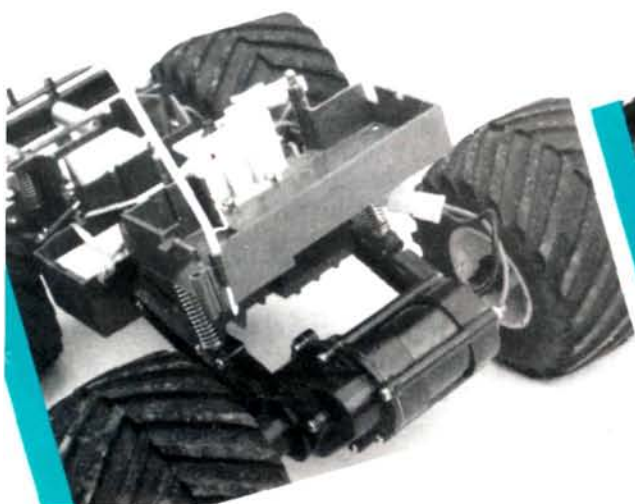


Although larger than the Bear, the Blackfoot proved to be just as speedy on pavement. With its taller height, weight transfer in hard cornering would pick up an inside front wheel, but didn't result in loss of control. The stock speed control gave smooth acceleration and control at low speeds.

The Big Grizzly was more at home scaling parking bricks than making high-speed runs. Its

speed on blacktop, slow by comparison, is just enough to be interesting. The Grizzly excels off road, climbing just about anything. It takes a considerably large object to stop the Big Grizzly.

These popular Monster Trucks just may provide the change of pace you're looking for. Besides, wouldn't it be great to see the hotshot's face as you park on top of his high-tech supercar?



Far left: The rear suspension on the Blackfoot shows its Frog origins. Center: The Big Bear uses coil springs on a simple, effective drive train. Left: Two coil-over shocks per wheel will appeal to full-scale monster truck fans.

	BIG BEAR	BLACKFOOT	BIG GRIZZLY
Scale:	1/12	1/10	1/10
Length:	14.75 inches	17.25 inches	17 inches
Wheelbase:	8.75 inches	10 inches	10 inches
Height:	9.5 inches	10.5 inches	11 inches
Width:	12 inches	11.5 inches	12.75 inches
Weight:	5 pounds, 2 ounces	5 pounds, 2 ounces	6 pounds, 14 ounces
Motor:	RS 480	RS 540	540-S
Drivetrain:	2WD	2WD	4WD
Battery:	6-cell, stick or hump	6-cell, stick or hump	6-cell stick
Body:	injection-molded white	injection-molded black	polycarbonate clear
Speed Control:	3-step forward, 1 reverse	Wound resistor, forward and reverse	
Performance on 50-foot straight:	3.9 seconds	3.9 seconds	6.2 seconds



**The following are the addresses of the manufacturers mentioned in this article:*

Marui: Distributed by Model Expo Inc., Dept RCA, 23 Just Rd., Fairfield, NJ 07007.

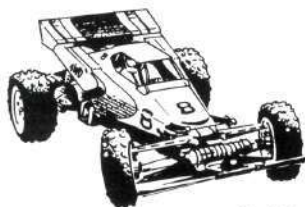
MRC/Tamiya, Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817.

Varicom Industries, 18480 Bandler Circle, Fountain Valley, CA.

Futaba Corp. of America, 555 W. Victoria St., Compton, CA 90220.

Moores Ideal Products, M.I.P., 838 E. Edna Place, Covina, CA 91723. ■

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Track Report

tomcat

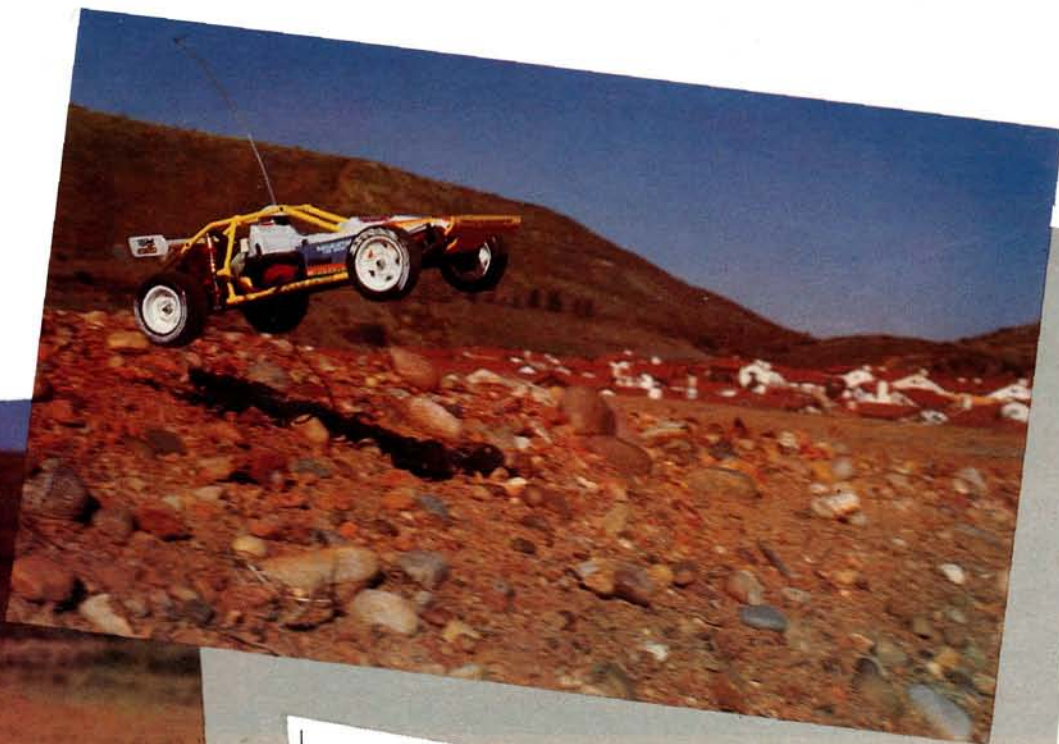
by MIKE LEE

WHEN YOU THINK of the tough little street cat hangin' out in the back alley, you think of what we call a tomcat. Now, we have a tough little car for the off-road environment by the same name, Circus Hobbies* Tomcat.

Tomcat is a 1/10-scale two-wheel-drive buggy meant to take on some of the toughest critters now on the race tracks. This offering by Hirobo of Japan features four-wheel-independent suspension, oil-filled dampeners at all four points, adjustable camber on the front and rear,



Circus Hobbies lands on all fours with this all new off-roader.



The front suspension is a single-wishbone trailing arm with transverse-mounted dampers. The action from off of the damper proved very good, with medium oil used. Camber-adjusting tierods are present just on top of the trailing arms and adjust easily. You can dial in a fair amount of camber with these babies. At the end of the arms are ribbed front tires mounted to nylon wheels and ball bearings—yes, ball bearings. The Tomcat has ball bearings all over the car, making them a standard item rather than an option.

The monocoque chassis is completely covered on top with a removable cover. This also serves to stiffen the whole chassis, making it a genuine monocoque design. The throttle servo is mounted under this cover just ahead of the rear shock tower. The throttle is a three-speed forward with brakes and reverse. It is pre-wired for the mechanic, leaving only the installation of the servo to the task.

At the rear the Tomcat is equipped with a geared differential mounted in ball bearings, including the rear wheels. The transmission is a belt-driven unit, using a fiber-reinforced

belt from the motor to the main-drive pinion shaft. From there, it runs through a reduction gear and differential before getting to the rear tires. The belt unit is adjustable to
(Continued on page 108)

torsion bars front and rear, and exclusive belt drive by Hirobo.

THE KIT. The Tomcat won't keep you in the workroom long doing the assembly. Like any varmint, the Tomcat is almost ready to run once you turn it loose from its pen. It comes out of the box 90% assembled, which saves about two evenings worth of work. The main chassis is of monocoque plastic and runs the full length of the car. Inside the chassis will rest the radio gear. A couple of minutes is all it takes to get under the hood of the Tomcat. Under the plastic roll cage are the steering mechanism and pre-assembled speed controller.

The steering mechanism is sweet and simple, consisting of a simple servo-saver mounted directly to the servo, coupled to the wheels with standard, threaded tierods. Ball links service both ends of the tierods.



Circus two-channel Winner radio features servo-reversing, end-point adjustment, continuously adjustable steering, throttle and steering trims.



G-P 10 chassis with optional bodies, from bottom to top, NASCAR Monte Carlo, C-2 Coors* Lamborghini, Ferrari Testarossa, and C-2 Valvoline Lamborghini.

by the RADIO CONTROL CAR ACTION STAFF

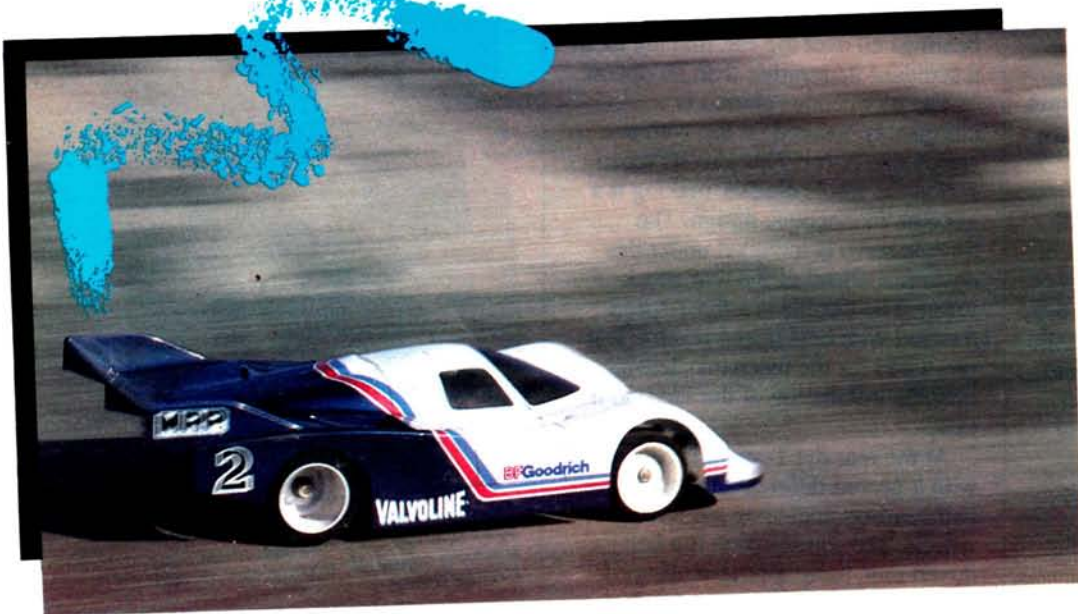
IN AN ENDLESS search to bring you the latest in R/C technology and product availability, *look what we found!* With a chance visit to the Model Racing Products* test track, we came across some very interesting activity. At first glance we almost passed off the activity as lunch-time 1/12-scale fun, but we soon realized it was a little more serious than that. There were four cars visible, a NASCAR Monte Carlo, a Ferrari Testarossa, a GTP Corvette/Lola, and a C-2 Lamborghini. And these cars were not 1/12, but 1/10-scale and rather sharp! So, with camera in

hand, the shutter was clicking as we watched the latest Italian super-car flash by.

Now, we knew that MRP was producing some fine 1/10-scale bodies, but the question remained as to what was underneath these bodies? Was it a car for testing the aerodynamics of new bodies? Or was it a new secret weapon MRP was about to launch onto the road circuit scene? We lingered at the track a little longer to see if we could figure out what was moving those bodies along the pavement, rather rapidly at that and with fine cornering ability. We felt we had stumbled onto something *hot!* With phone in hand our investigation began and this is what we found out.

Yes, indeed, MRP had come up with some new body designs that were getting ready for release. Those are the Ferrari Testarossa, the Lamborghini C-2 in 1/12, 1/10 and 1/8, the Corvette/Lola GTP, the NASCAR Pontiac 2+2, the NASCAR T-Bird, and a T-87 Lola Indy car body. But the big question remained, what was the car we photographed at

(Continued on page 98)



Engine Review

by PETER CHINN

SPECIFICATIONS

Type: Air-cooled, single-cylinder rear-exhaust two-stroke cycle with crankshaft rotary-valve and Schnuerle scavenging.

Bore: 0.650 in. (16.51 mm)

Stroke: 0.640 in. (16.24 mm)

Displacement: 0.2124 cu in. (3.480cc)

Nominal Compression Ratio (full stroke): 10.0:1

Speed Control: Irvine barrel throttle carburetor with adjustable automatic mixture control.

Checked Weight: 289 grams (10.2 oz.)

Mounting Dimensions:

Crankcase width: 29.3 mm

Length from driver face including exhaust stub: 86.0 mm

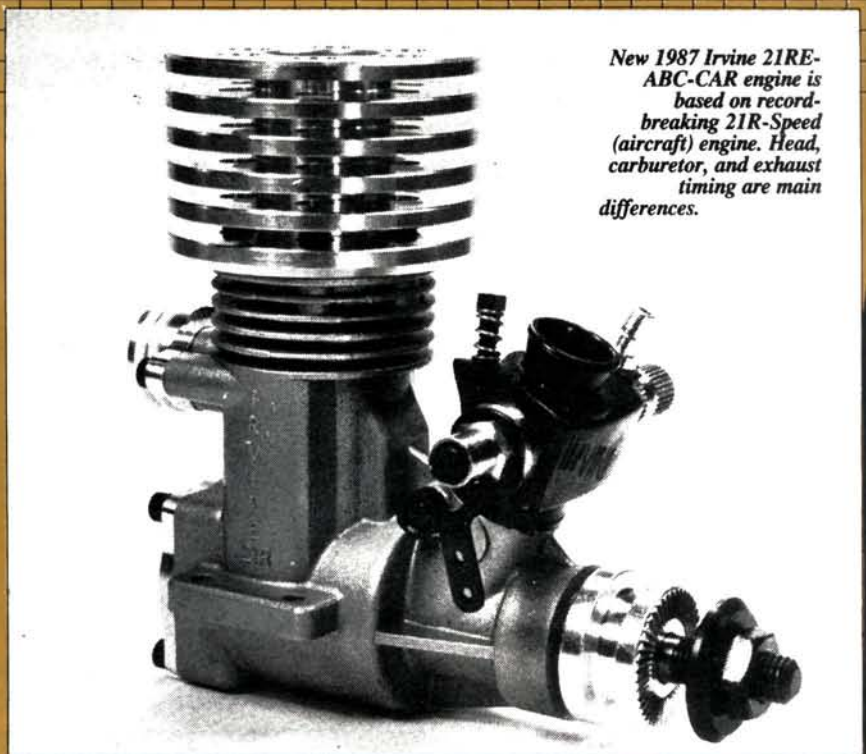
Height above CL: 76.5 mm

Bolt hole spacing: 36.5x15.9 mm (1 7/16x5/8 in.)

Manufacturer's Claimed Power Output: Not stated.

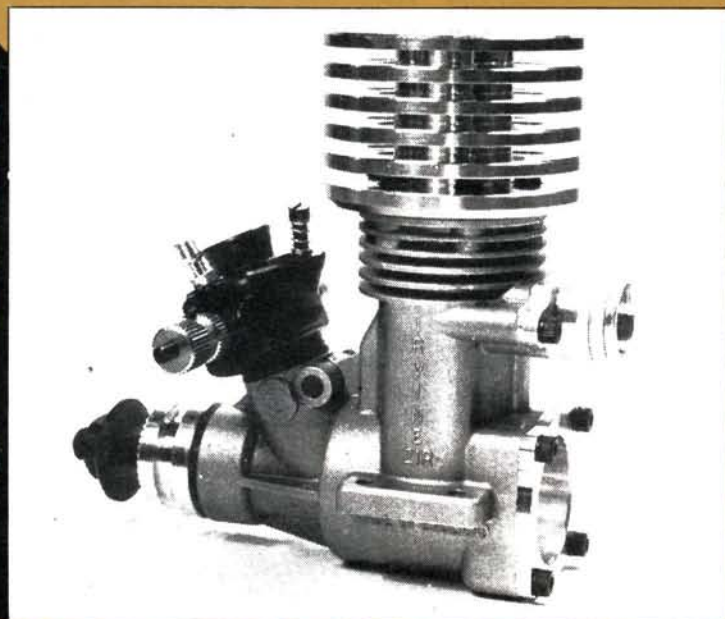
Manufacturer: Irvine Engines Ltd., Brunswick Industrial Park, New Southgate, London N11 1JL, England.

U.S. Sales: Great Planes Model Distributors Co., P.O. Box 4021, Champaign, IL 61820.



New 1987 Irvine 21RE-ABC-CAR engine is based on record-breaking 21R-Speed (aircraft) engine. Head, carburetor, and exhaust timing are main differences.

IRVINE 21-RE-ABC CAR



Unlike side-exhaust Irvine 20 range, "21" models have rear exhaust stub for connection to special muffler or tuned pipe system.

THE IRVINE 21RE-ABC car engine is one of a new 1987 range of rear-exhaust 3.5cc class Irvine motors that supplements the well established Irvine 20 side-exhaust models. Incidentally, the "21" designation, as distinct from the side-exhaust models' "20" label, is simply to aid identification. Both series actually have the same .212 cu in. displacement (3.48cc) derived from a common bore and stroke of 0.650 in. x 0.640 in. It will be observed also that, like most American manufacturers, the British Irvine factory still works to Imperial (English) measurements. This is in contrast to the Continental European and Japanese manufacturers who all use the metric system, even though their engines are nearly always identified by cubic inch displacement groupings, such as .21, .40, .61, .90, etc.

Although the manufacturer has so far made no specific performance claims for the Irvine 21R range, the potential of these engines was clearly demonstrated just prior to their release when, last October, a factory prepared 21R-Speed aircraft version exceeded the world C/L speed record for models powered by engines of up to 5cc (.30 cu in.) displacement, by reaching the quite remarkable velocity of 194 mph. This, of course, was achieved with an unrestricted air intake and a lengthened exhaust period to suit a specially made tuned exhaust system, but the basic engine was otherwise unchanged from the standard over-the-counter 21R-Speed model.

As has been the case with so many successful engines in the past, there is nothing very revolutionary about the Irvine 21R: it is merely a good basic design that has been intelligently developed.

The engine is built around a one-piece body casting comprising the crankcase, front housing, and cylinder block. This contains three well proportioned transfer channels and also embodies a large intake boss for the carburetor. The stock version of the 21R car engine is fitted with a standard Irvine carburetor having a $\frac{7}{16}$ in. (11.1 mm) o.d. spigot diameter, but will accept bigger carburetors of up to 13 mm spigot diameter. An aluminum split sleeve adaptor is used with the Irvine carb.

A winning R/C aircraft engine has been transformed for car racing



Parts include counterbalanced crankshaft with large gas-flowed port, ABC piston/cylinder assembly, heavy-duty conrod and large heat-sink head.

The crankshaft, which is carried in ball-bearings, front and rear, has a 12 mm diameter main journal, a 6.34 mm ($\frac{1}{4}$ in. nominal) diameter front journal, and a 4.74 mm ($\frac{3}{16}$ in. nominal) diameter crank-pin. The shaft has an 8.3 mm bore gas passage that is fed from a large, 14.4 mm

long, rectangular valve port, gas-flowed as an aid to improved breathing. The valve port is timed to remain open for a generous 200°-plus of crank rotation, timed, according to our measurements, from 37° after BDC (bottom dead center) to 59° after TDC (top dead center).

The Irvine 21R has an "ABC" type piston/cylinder assembly. For the benefit of readers who are unaware of the precise meaning of this, "ABC" indicates that the engine employs an Aluminum piston running in a Brass cylinder-liner having a Chromed bore. Because brass (when compared with the usual steel liner material) has a coefficient of expansion that is closer to that of aluminum, it is possible for the piston to maintain a close working clearance within the cylinder-liner without the use of a piston-ring. The chromium plating on the cylinder wall (sometimes an alternative deposit is used but the principle is the same) provides a hard, anti-galling surface for the soft aluminum of the piston and the mechanical efficiency of the engine is raised because frictional losses are reduced, by comparison with those of a conventional ringed piston. Heat transference is improved by

(Continued on page 52)



Irvine 21 has one-piece investment cast body, machine backplate and exhaust stub and an automatic mixture control carburetor.

NEW

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Mid 4

photos by LOUIS V. DEFRANCESCO JR.



Gorham's first effort in the 4WD R/C car race proved to be a formidable competitor.

by STEVE POND

THE ALIEN MID4, distributed by Gorham Model Products*, is the latest release from Hirobo, a leading manufacturer of R/C helicopters for many years and certainly not a newcomer to the R/C industry.

The Alien Mid 4, as the name suggests, is a 1/10-scale, four-wheel-drive, off-road R/C car with a mid-ship motor, which simply means that the motor is located in front of the rear

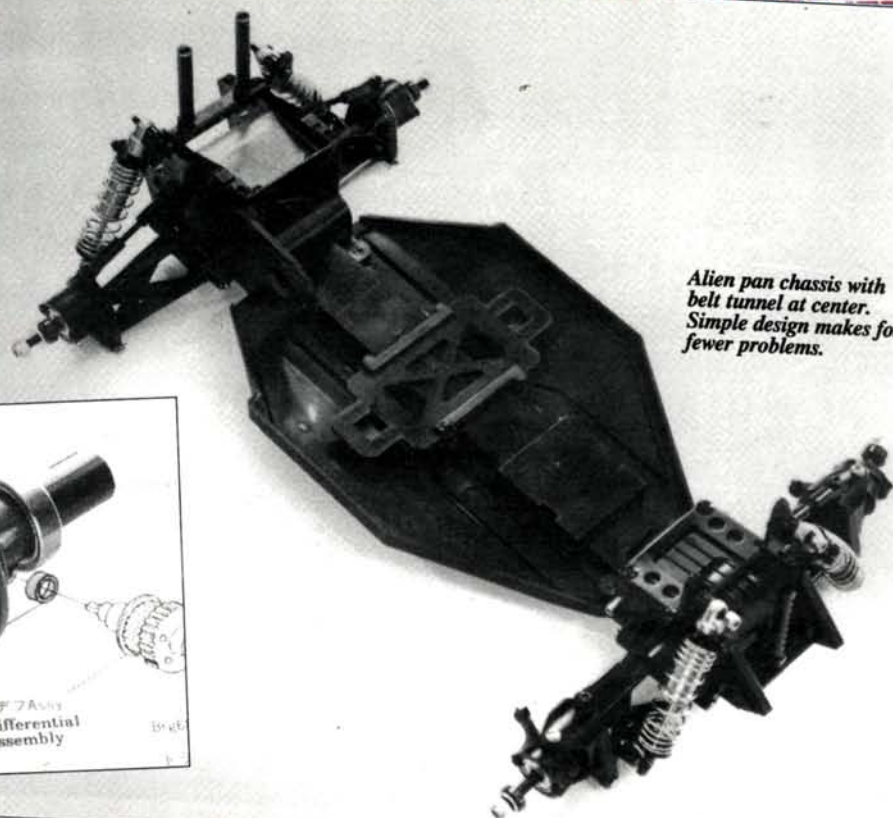


from Gorham Model Products

Assembled differential housing with cog belt sprocket at right.



Rear differential gear assembly



Alien pan chassis with belt tunnel at center. Simple design makes for fewer problems.

wheels. By locating the motor toward the center of the car, you get better weight distribution between the front and rear. This will make for better handling and more stability in flight.

The name Alien, I think, comes as the natural result of having such a radically new car that looks like it belongs to a scene in the film *Heavy Metal*.

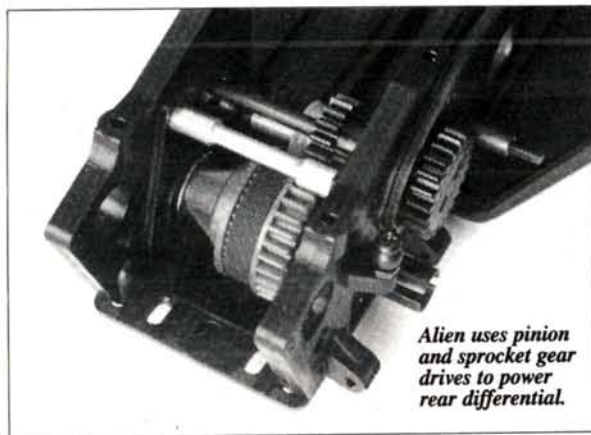
THE KIT. Perhaps one of the most intriguing features of the Alien is the use of a timing belt to connect the front and rear differentials. Though this isn't a new concept, it has been used on most of the world champion 4-wheel-drive 1/8-scale on-road gas cars because of the low level of friction the belt creates. Aside from the belt drive, the Alien has a host of other features such as

the adjustable oil-filled coil-over shocks on each corner, front and rear semi-wishbone suspension with adjustable camber, a three-speed forward, one-speed reverse speed controller with braking, spiked knobby tires that saddle lightweight, one-piece wheels, a full set of 14 ball bearings, overheat prevention circuitry, BEC, and a choice of three pinion gears for optimum performance.

Included in the kit are a few tools (1.5-, 2-, and 3-millimeter Allen wrenches) that will be necessary for assembly, but this is far less than what is required to complete this kit. Other tools recommended by Hirobo to aid in the assembly are as follows: a Phillips-head and flat-blade screwdriver, needle-nose pliers and nippers, hobby knife, scissors, 3- and 4-millimeter nut drivers, cyanoacrylate glue, and paint for use on polycarbonates. Aside from these items, you'll need a 7.2V, 1,200 mAh battery pack and charger and a two-channel radio system, preferably with BEC. The radio system I chose to use is the new Futaba* Attack-R dual stick, digital-proportional radio control. The R in Attack stands for servo reversing. The Attack comes equipped with a pair of S-28 servos, FP-R2G receiver, and of course BEC.

ASSEMBLY. The first few steps in the assembly process outline the front and rear differentials. The actual differentials are already assembled but you must attach the bearings and drive yolk prior to installing them into the axle mounts. The front and

(Continued on page 79)



Alien uses pinion and sprocket gear drives to power rear differential.

Track Report



ROBBE Jeep

by T.J. LYN

THE CONSTANT demand for new radio-control products has prompted Robby to introduce another fun vehicle that's perfect for the entry-level R/C modeler. The Jeep CJ-7 Laredo will satisfy the new modeler's need for economical and easy-to-assemble kits, and the experienced modeler's need to have a fun break from sophisticated big-buck machines.

Once again, Robby of Robby Model Sport* is providing us with a realistic and authentically detailed replica of the CJ-7 in 1/10-scale, as they did with the Mercedes we reviewed in our Winter '87 issue.

The Jeep CJ-7 only requires final assembly and is almost ready to run right from the box, all you need to supply is the radio system. Robby supplies the kit with dry-cell batteries (four C-cells) and a

suitable battery box to mount them in. The Jeep is powered by an RS-380-S motor, which provides good power range for all types of terrain. But if the four C-cells aren't powerful enough, Robby does have a 6V/1.2-Ah battery available (part No. 4046) that will solve the problem.

The bathtub-type chassis of the CJ-7 will give you good protection for the electrics of the vehicle, and the four-wheel-independent suspension with shock absorbers give this kit the handling a Jeep is famous for. Also mounted on this chassis is an infinitely variable speed control transmission.

(Continued on page 101)



Mounting Lexan Bodies

by PHIL SROKA

**It's easy to mount
the body
of your choice.**

I'M SURE at one time or another many of you have wanted to mount a full-size car body onto one of your 1/10-scale off-road cars. You may have hesitated either because of the availability of mounts or choice of bodies. But now, with companies like McAllister*, Parma*, Bo-Link*, and Model Racing Products* punching out bodies of your favorite rides, there's good selection; street rods, stock cars, or my favorite—street machines.

In this article I'll show you how to make body mounts that are sturdy enough to hold up during racing conditions, and are easily adjustable and inexpensive.

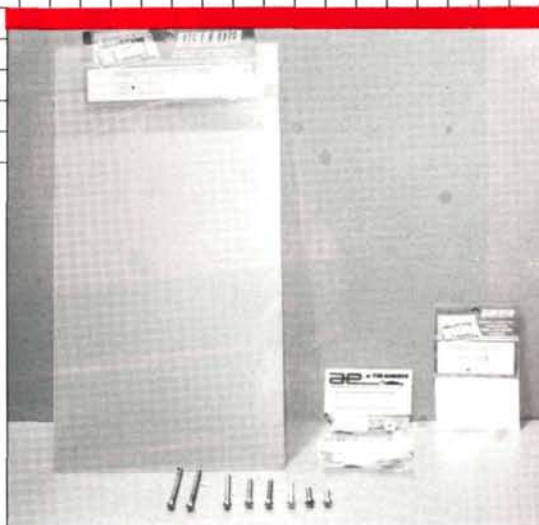
The materials you need are fiberglass chassis material, which may be purchased from Parma, or you might already have some lying around from an old chassis or

project car.

Next, you'll need 8-32 screws and nuts of various lengths, and two No. 6330 Associated Electrics* body mount kits.

Start out by finding a location on the car wide enough to mount two strips of chassis material and not interfere with the suspension or steering. In the pictures, I'm applying mounts to a Fox. But I've also done this to a Hornet, Falcon, and RC10 with minor changes.

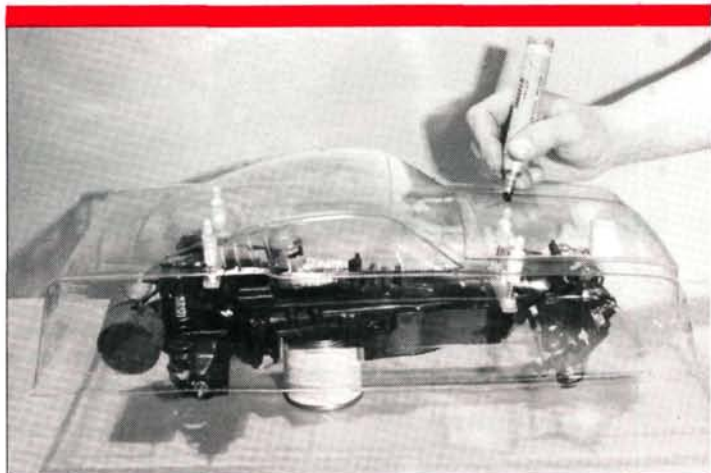
Begin by cutting two 1x5-inch strips of chassis material. Once cut, put in the area located to mount the strip. Measure the distance for mounting the screws, drill holes, and mount to the car. Next, drill holes to mount the posts you want, as far apart as possible. This will make the body more sturdy by preventing the wobble common to the single-post mounts.



The materials you'll need.



Body of choice, finished mounts, body washers, and posts.



Set body on mounts and mark for holes.



Finding suitable locations for mounts on Tamiya Fox chassis.



Lay strips of chassis material in location and mark for screw holes.

After the holes have been drilled, insert an 8-32 screw that best suits the height of the body. Remember that you'll gain almost 2 inches with the mount. Secure the screws with nuts to keep the mounts from loosening. Take off the tires and wheels to measure the correct body height. Mark where the body mounts should be made on the body to make holes for the posts. Finish by painting the body in the usual manner. I recommend airbrushing using a Badger* No. 200-2-HD and Pactra* paints for best results.

Once complete, set the body on posts and adjust it to get the desired ride height. Once finished, I added MRC/Tamiya* tires and aluminum wheels from Advance Manufacturing* for that street machine look.

This type of car body will work with

almost any car you might have, no matter what's under the hood.

Wild wheels, tires, paint, and body give you the ultimate street machine for cruising or looking for the local drive-in.

**The following are the addresses of the companies mentioned in this article:*

McAllister Racing, 4827 Top Circle, Dept. CA, Simi Valley, CA 93063.

Parma International Inc., 13927 Progress Parkway, North Royalton, OH 44133.

BoLink R/C Cars Inc., 420 Hosea Rd. Dept. 487, Lawrenceville, GA 30245.

Model Racing Products, 18676-142nd Ave., N.E. Woodinville, WA 98072.

Associated Electrics, 1928 East Edinger, Santa Ana, CA 92705.

Badger Air-Brush Co., 9128 W. Belmont Ave., Franklin Park, IL 60131.

Pactra Industries, 16946 Sherman Way, Van Nuys, CA 91406.

MRC/Tamiya, 2500 Woodbridge Ave., Edison, NJ 08817.

Advance Engineering & MFG. Co., 180 S. Hwy. 67, Unit 6, P.O. Box 766, Woodland Park, CO 80866. ■



Mounts installed. Now that holes have been placed, body can be painted. Author used Pactra paints.



Finished car. Note location of mounts and ride height to clear tires.

The Pole Position

by RICH HEMSTREET

NEW CARS. It's difficult keeping up with the growth in our sport. New cars in different scales are popping up all over the place. There are new cars in most scales, plus gas-powered $\frac{1}{10}$, electric-powered $\frac{1}{24}$, electric $\frac{1}{12}$ dragsters, gas-powered $\frac{1}{8}$ and $\frac{1}{4}$ dragsters, and $\frac{1}{12}$ four-wheel-drive off-road.

Presently, $\frac{1}{10}$ -scale on-road racing is growing rapidly. BoLink* has been building cars for this type of racing for some time. Now D&D Graphite*, MRC-Tamiya*, and MRP* are getting involved. From what I hear, more are on the drawing board. Off-road machines are going on diets and being converted to road racers. The biggest problem with this growth is that there have been no rules or guidelines to follow during this expansion. R.O.A.R. has proposed a set of



Stock cars and sprint cars lead the growth in $\frac{1}{4}$ -scale R/C racing.



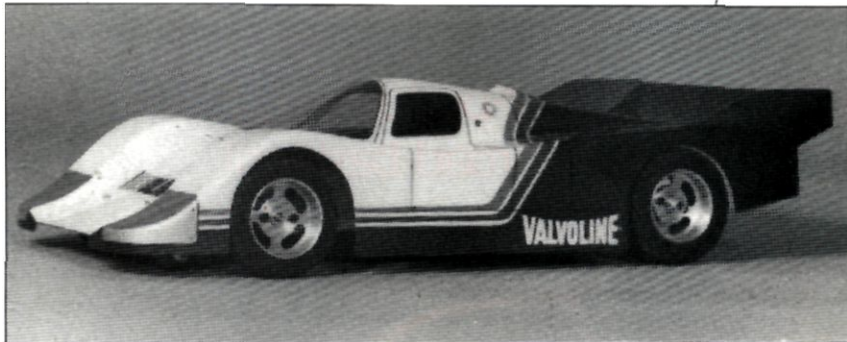
The $\frac{1}{8}$ -scale Moody American sprint car ready to kick up dirt on midwest oval tracks.

rules for $\frac{1}{10}$ -scale road and oval racing. The sheet of rules I have may be amended by the time they are adopted. But I think there's plenty here to discuss.

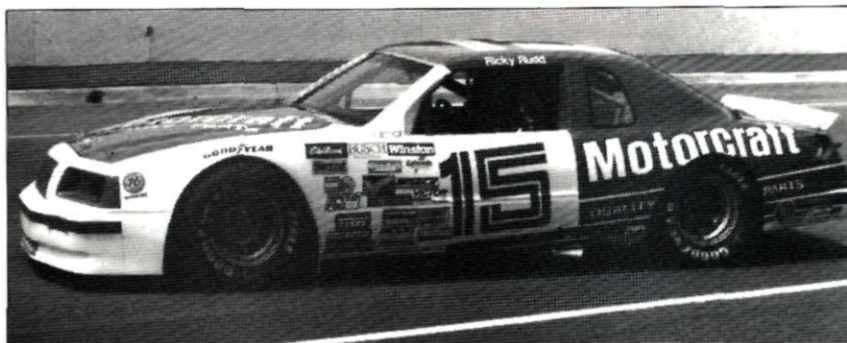
The first thing to notice is that these rules are for road racing and oval racing. It doesn't state whether that means all $\frac{1}{10}$ ovals, or if it leaves the $\frac{1}{10}$ dirt oval races under the off-road rules. Hopefully, these rules won't disturb the dirt oval scene.

Three separate classes are proposed: Stock, Modified, and Open. That is a good idea, but let's be sure all the classes are equally promoted, with separate regional and national championships. R.O.A.R. should limit drivers in national events to a single class, so that we have 30 different drivers in three A mains and crown three separate national champions.

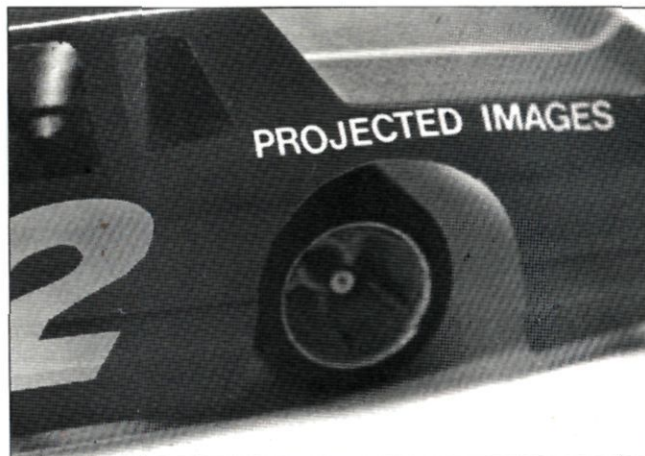
The motor limitations are consistent with present R.O.A.R. rules in other classes. The section on batteries calls for standard 6-cell sub-C packs. I would like to see 7-cell batteries used at least in the Open class, perhaps in the Modified class



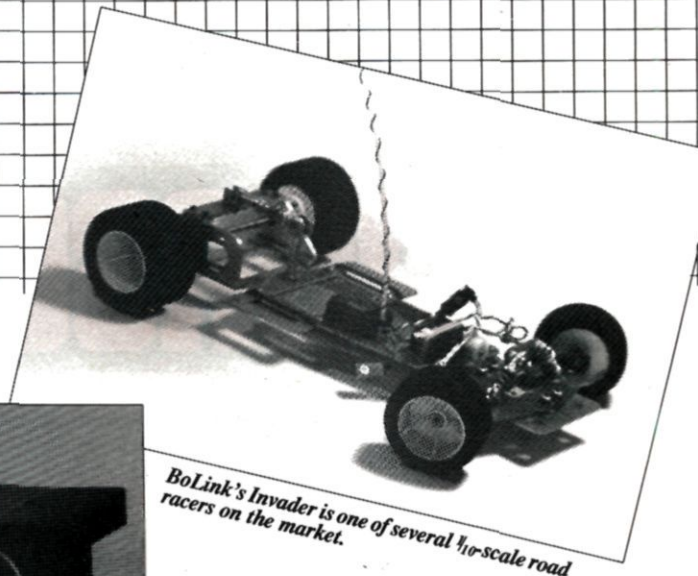
The MRP C-2 Lamborghini is now available in 1/10-scale.



Rocky Rudd's NASCAR racer is a 200-mph billboard for Motorcraft.



You can find local businesses to sponsor your racing efforts.



BoLink's Invader is one of several 1/10-scale road racers on the market.

also. The body rules just refer to the R.O.A.R. approved body list. It seems like this would be an excellent time to get rid of CanAm car bodies from one scale of racing. Do it now before that's all that is being run.

Chassis dimensions are straightforward, 9.5 inches maximum width, 21 inches length, including body and bumpers. The wheelbase calls for 10.5 inches, plus or minus 1/2 inch. This is the most important section of the rules because it provides the manufacturers guidelines to work with. I'm not sure if the wheelbase dimensions permit enough latitude for drivers who are converting off-landers to race on-road. If not, some type of temporary rule should give those drivers a couple of years to comply. Let's not force someone to buy new equipment to race.

Chassis material is limited to plastic, fiberglass, steel, or aluminum in Stock and Modified. Any material can be used in the Open class. I don't care for this; we should be receptive to new kinds of materials. R.O.A.R. may want to restrict the Stock class to production chassis only. They may also need to place a cost limit on Stock class kits. This would keep one-of-a-kind specials or prototypes from winning the Stock class titles.

Stock and Modified classes are restricted to two-wheel drive (rear-wheel-drive only). The Open class permits both two-wheel drive and four-wheel drive. I think there is a need to make competition fair between the two-wheel-drive and four-wheel-drive cars, possibly by a higher minimum weight for the four-wheel-drive cars. This is to prevent an all-four-wheel-drive class from develop-

(Continued on page 127)



MRC/TAMIYA

PORSCHE 959

Another MRC first—a super-performing 4WD 1/12-scaler for on- or off-road bashing!



by STEVE POND

ONE CAR that has been hailed as just about the hottest vehicle on four wheels to ever roll out of the doors at the Porche factory in Stuttgart, Germany is the new high-tech four-wheel-drive Porche 959, the first effort from Porche to venture into the world of four-wheel-drive—and what an effort it is!

The 959 chassis harnesses a rear-mounted flat-six power-plant that is graced with two sizeable turbochargers to aid in the development of about 450 horsepower. With such head-spinning horsepower and a gross weight of 2,900 pounds, it's easy to see how this car can be an indomitable force in the off-road rally.

Having recognized the way many people would be able to

identify with a car of this stature, MRC/Tamiya* has fashioned an all-new 1/12-scale on-/off-road, four-wheel-drive R/C car to join the Tamiya ranks, and it's called, you guessed it, the Porche 959.

THE KIT. The 959 is a completely new design that shares no parts with any of the other cars in the ranks. With this new design come many new features such as the oil-filled, coil-over shocks with individual reservoirs, a mid-ship, inline motor mount, a package of 10 precision ball bearings, functional headlights, RX540VZ Technigold motor and a host of other goodies. Also included in the kit comes a set of off-road tires; but as mentioned, the 959 is suitable for both on- and off-road use. (Street tires are optional.)

CONSTRUCTION. To aid in the construction, MRC/



Tamiya has included some items such as grease, switch lubricant, a box wrench that fits all size nuts used in the kit, an Allen wrench, and some damper oil. The tools you'll need to supply are large- and medium-size Phillips-head screwdrivers, long-nose pliers, side cutters, instant cement, scissors, and a sharp hobby knife. Once you gather these items, you're almost ready for assembly. Other items that you'll need for the 959 are a two-channel radio system, a 6-cell 7.2V, 1,200 mAh battery pack, and Ni-Cd battery charger.

Before purchasing a radio system, there are some dimensional limitations due to the small size of the chassis. On page three of the instruction manual there are some measurements for suitable servo and receiver dimensions (LxWxH). The servo dimensions must not exceed 41x21x42 millimeters and the receiver dimensions must not exceed 61x40x20 millimeters. I chose to use the Futaba* Magnum Junior two-channel digital proportional radio with the S28 servos and the FP-R2GS receiver, which was a shoe-in for the 959. For any other system, I'd recommend checking the dimensions of these items before you buy them. A system that includes BEC (battery eliminator circuitry) is also recommended because the size of the chassis doesn't allow room for a receiver battery pack. Once these

tasks are out of the way, you may begin the assembly.

The construction begins with the "center" section of the chassis, which houses the battery and steering apparatus, and then moves on to the rear differential assembly. At this point you must decide whether the 959 will be used for on- or off-road. This is necessary because there are two sets of gears supplied in the kit, one for off-road, and one for on-road. The off-road set consists of a 16-tooth pinion and a 41-tooth drive gear for more torque and longer running times. The on-road gear set consists of an 18-tooth pinion and a 40-tooth drive gear to compensate for the smaller tires used for the asphalt. Either combination of gears can be used for both on- and off-road but it's a good idea to make this choice be-

fore assembly

photos by LOUIS V. DeFRANCESCO JR.

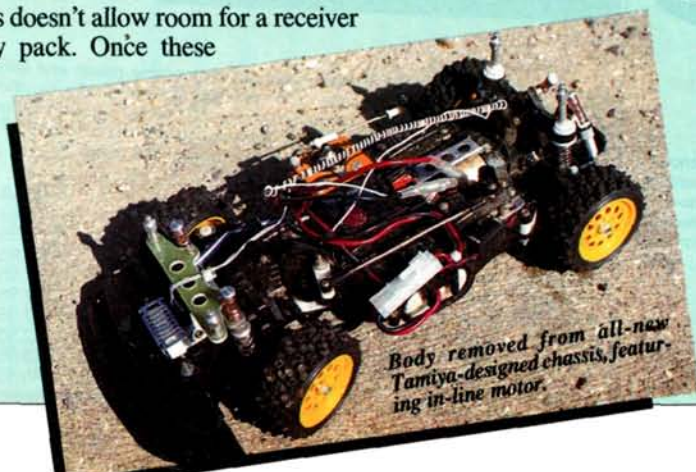


because these gears aren't easily changed.

From here the assembly moves on to the rear suspension components. Here you must make another choice regarding the upper control arms. There are three different lengths included in the kit and each has a different effect on handling. The shorter control arms will give an increase in negative camber when the suspension is compressed. This will either increase understeer or decrease oversteer depending on the track surface. The longer control arms allow for little change in camber under compression. This will keep the wheels in the straight-up position and give the opposite handling characteristics of the aforementioned. I found the longer control arms most suitable for the track I run on, but you'll have to do some experimenting to determine which will be most useful to you.

Once the rear suspension is complete, the whole rear

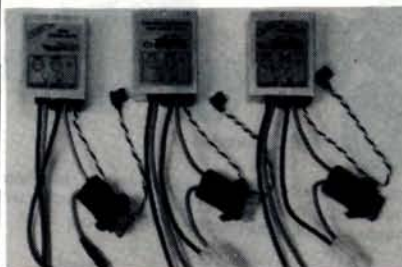
(Continued on page 46)



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PORSCHE 959

(Continued from page 41)

assembly is attached to the center section, which sandwiches the motor in the middle. This is then followed with the assembly of the front differential and suspension, shock absorbers, and radio installation.

Included in the kit are servo horns that will adapt to Futaba, Sanwa, and Acoms radio systems. If you prefer another system, you'll have to see if this equipment will fit your system or else adapt one of the servo horns that are included with the radio.

The next and last step is the painting and detailing of the body. I chose not to use all of the parts available for the body to save a little weight. But if it's a scale replica you're after, the 959 epitomizes scale detail. The kit includes a set of headlights, tail pipes, two figures for the cockpit, rearview mirrors, roof-mounted brake lights (non-functional), and an extensive decal sheet. The only recommendation here is to take a little extra time in completing the body, and it'll come out looking sharp!

PERFORMANCE. As far as performance goes, the 959 is the most versatile R/C car on the market. The car is equally at home on the dirt or pavement. My first go at running the 959 was on the pavement outside my house. One thing that becomes very evident upon giving the throttle a healthy squeeze is the 959's ability to turn a fresh tire into bologney skin. After a few battery packs you'll learn to tame the power of the 959. On the pavement the car handled rather well with a little understeer while throttling through the corners, due in part to the amount of dirt on the ground. The place that the street tires really excel, and where foam tires are useless, is on a very slick surface like a gymnasium floor.

Next: the dirt tires. Because the 959 obviously has more suspension travel and ground clearance than its 1/12-scale counterparts, it's just about the only one that can take on an obstacle bigger than a cigarette butt. Even though the 959's suspension system isn't adjustable, the car seemed to take the off-road terrain very well also. The most startling portion of my test was the way the 959 handled with the off-road tires on carpeting. You can bury the throttle and the car simply takes off, although a lot of care has to be taken to keep the car from rolling in the turns due to the riveting traction these tires have on the carpeting. As you get used to the car's handling on this surface, you can see it pick up its inside rear tire as it

(Continued on page 52)

1/10-scale Oval Stockers

by BILL LANDAN



Oval stockers beg to be maxed out.

photo by ALAN J. PALERMO

THE LAST BUT MOST visually distinctive modification to your off-roader is the body, what really characterizes any "stock car." The basic concept is to look around and find a body shape that fits your chassis the best. If you're into stock cars, you may have

brand preference such as Ford, Chevy or whatever, and there's a wide range of stock bodies available so don't be afraid to coax your parts dealer into ordering it. You're going to have to use your creative ingenuity in mounting these bodies. There are several body post or mounting kits available. Try to mount the body as low

as possible without interfering with suspension or tire clearance. Also try to put the body posts on the extremities of the car, even on the bumper up front because the bodies are much larger and tend to flap around if large portions are left hanging out without support. If the body starts dragging or flapping on the ground it will cost you a race. This also digs up the track and causes ruts to form, making it difficult for everyone.

When it comes to painting and detailing your stocker, it's fairly simple. You can find some good reference in *Stock Car Racing*, or *Circle Track* magazine. Try to use contrasting light-and-dark color schemes. McAllister Racing has Superflex Tape for striping and a new Paint Decal series for body detailing. You even get window net and grill screen on these decal sheets. Autographics* has some great sponsor decals for detailing your stocker. For those of you who are all thumbs at painting, Pactra* has some new paint in an aerosol can that takes the pain out of painting. The stuff won't chip off either.

Once you've done a nice simple paint job and stuck as many decals on the car as space allows, just as it is with the full-scale stockers, you can dab a few spots for rivets here and there. Some of the guys

photo by ALAN J. PALERMO





Get down and dirty with outlaw machines!

will start sticking wings and fins everywhere until the top of the car looks like a fun-house maze. You can be the judge on how much you need or what works when you get the car on the track. Get some nice hefty body pins, grab a frequency clip and hang on 'cause you're in for the drive of your life.

The rear-wheel-drive cars are fun to drive and exciting to watch with lots of broad sliding action, but get the children back from the track when the four-wheel-drive modifieds start blasting a blue groove around the track.

If all of this has whet your appetite for oval stock cars, we'll talk later about the

pavement burners. And in closing I'll mention that just a short while back, I flew to Florida for a 1/12- and 1/10-scale, high-banked, concrete oval race at Lake Whippoorwill Speedway where I saw some R/C stock action you might want to know more about.

**The following are the addresses of the companies mentioned in this article:*

Autographics of California, 8536 Kern Canyon Rd./169, Bakersfield, CA 93306.

McAllister Racing, 4827 Top Circle, Dept. CA, Simi Valley, CA 93063.

Pactra Industries, 16946 Sherman Way, Van Nuys, CA 91406. ■



The options are endless.



Track Report

CHAINSAW ENGINE-POWERED OVAL
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Raco

Roadrunner

by PHIL SROKA

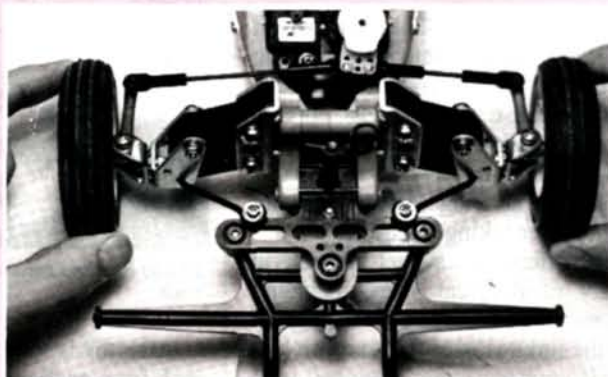
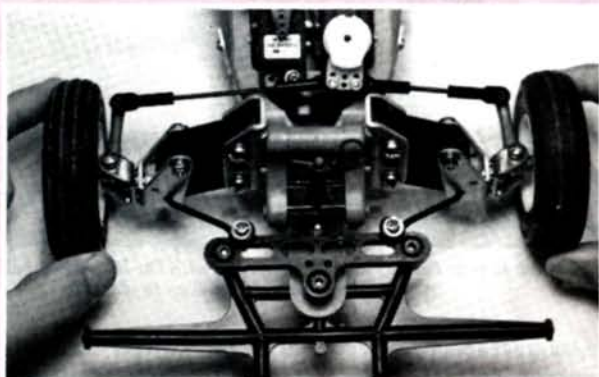
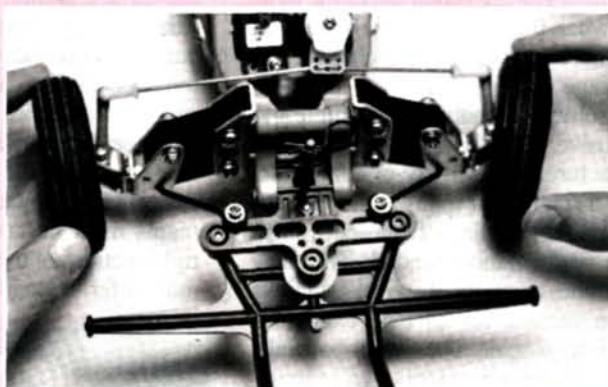
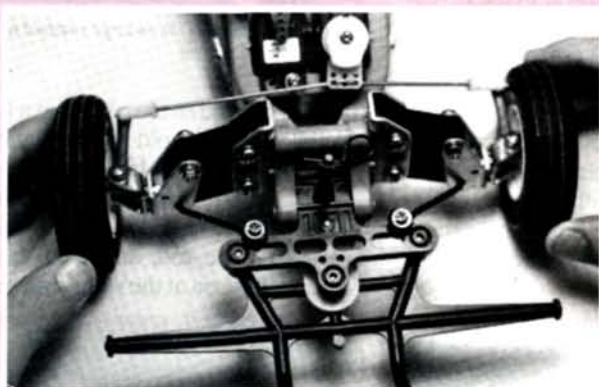


WHEN the name Roadrunner or Jack Rabbit (from Raco*) arises you think of the 1/4-scales with speed and ability to adapt to all sorts of terrain. In the Spring '86 issue there was an article on the stock version. I'll pick up from there with the modifications to transform the Rabbit into a rabid Rabbit; and all three modifications apply to the Roadrunner as well. First we'll start with the

Steering Linkage

by STEVE POND

Get that positive steering feel by reducing slop.



Top left and right: Note the amount of steering slop, largely caused by use of Z-bends. Bottom left and right: Note difference with new linkage using ball-links in place of Z-bends. Far less slop is evident.

ONE OF THE BIGGEST problems plaguing even the most formidable of race cars in the R/C car market, both on and off-road alike, is the slop in the steering linkage. "Slop" refers to the amount of distance the front wheels will turn left to right without any movement of the steering servo.

For this article, I chose to do some doctoring on the MRC/Tamiya* Frog's steering linkage. Don't get the impression that this is the only R/C car on the market

with this affliction. The slop is evident on just about every kit available.

There are basically two means of connecting the servo to the steering apparatus that are standard equipment in just about every kit. One is the Z-bend, the other the snap-on ball link. Both of these types of linkages have their good and bad points, however both simply allow for too much play.

A Z-bend is a section of solid metal rod that has two 90° bends in the end. This Z-bend is then slipped through a hole on the servo-saver. The Z-bend is good

because it will not allow the linkage to become dislodged from a hit by a stray car or a hard shot taken while covering some rough terrain. The downfall of the Z-bend occurs when the linkage is disconnected for adjustment or repairs. The hole in the servo-saver becomes elongated, causing an increase in the amount of steering play each time it is removed. This can also be caused by just regular wear.

The snap-on ball-link is better than the Z-bend since it allows for less play in the steering linkage. The snap-on ball-link system uses a steel or brass ball that is

bolted to the steering arm. This ball is then connected to the steering servo by a threaded rod with a plastic end that snaps over the ball. As mentioned earlier, this will reduce the amount of play in the linkage, but it does not eliminate it. One of the most glaring problems of the ball-link is when the front wheel takes a hard shot. There's a pretty good chance that the linkage will pop off.

The solution to this is rather simple and inexpensive. Du-Bro Products Inc.*, a manufacturer of a variety of connectors used in airplanes for many years, has just introduced a new line of car accessories for the performance-minded. This new line includes a variety of swivel-ball links that are suitable for all R/C cars from 1/12-scale to 1/8-scale. The swivel-ball links differ from the aforementioned in many respects.

First, the swivel-ball link is a rod end with the "ball" molded into it. By molding the metal ball into the rod end it lessens the play because there is just enough clearance to allow the ball to rotate. Second, because the swivel-ball link is bolted to the steering arm, it will not check-out after taking a hard shot.

Du-Bro offers these swivel-ball links in a variety of different sizes, including metric, so it is possible to use the original rods if the linkage is of the snap-on ball family. If your car came equipped with Z-bends or, in the case of the Frog, a Z-bend at one end and a snap-on ball at the other, you'll need to devise your own rod. I recommend using the Du-Bro 2-56 steel rod because it will take more punish-

ment than the standard rod.

To begin replacing the steering linkage on your car you must first remove the original linkage. Once this is done, take a ruler and measure the distance between the center of the cup on the ball-link, and the vertical section of the Z-bend. If your car uses only Z-bends, measure the distance between the two vertical sections of the Z-bends. For cars equipped with only snap-on ball-links, measure the distance from the center of the cup on the ball-link to the center of the other. Whatever your car comes equipped with, these measurements must be taken for both left and right sections of the linkage because they may differ in length.



Plastic bearings such as these cause slop as they wear.

After this is complete, subtract about 7/8 inch from each measurement. Now take the Du-Bro threaded stainless steel rod and cut it to the respective lengths. I used a Foredom flexible shaft grinder with a stone cut-off wheel for this task. However you choose to do your cutting, always



Du-Bro Products swivel-ball links bolted in place.



Action of Z-bends can enlarge control arm holes.

de-burr the end of the rod using a fine-grit file or stone to avoid any damage to the inside of the swivel-ball links.

Now you're ready to assemble your new linkage. Get one of the rod ends started on the rod, and then the other. Thread these on at the same time until the



New linkage arm with Du-Bro swivel-ball links at both ends matched up to old unit.

centers of the swivels reach the same measurement as the length of original rod (first measurement). Attach the linkage to the steering-servo with the hardware included, and then place the Allen-head bolt through the hole in the swivel on the other end. Do not fasten it to the steering arm.

At this point, make all the final adjustments in the linkage and fasten it with some thread-locking agent. Finished!

For some ultra-bulletproof linkage, try the Du-Bro 4-40 swivel-ball links with some Du-Bro stainless steel 4-40 threaded rod. This system is also useful in tightening up speed controller linkages.

One thing to keep in mind is that all cars have certain design limitations. Some of the play in the steering is caused by cars have certain design limitations. Some of the play in the steering is caused by

(Continued on page 106)



A loose-fitting, worn ball-link should be replaced.

The Starting Line

by the RADIO CONTROL CAR ACTION STAFF

Well, it's happening again! Everyone has dragged out their buggy for springtime and summer use. But you die-hard racers and indoor trackers haven't slacked off a bit, have you? That's all right; it just goes to show that the R/C car sport has something for everyone at all times.

Just as in the world of R/C airplanes, there's been a move to both larger and smaller R/C cars. Let's look at this new phenomenon, and keep in mind that your comments and suggestions can be sent to "The Starting Line," c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897.

Q.

What's the advantage of the large-scale R/C cars?

A.

One of the biggest advantages is that all parts are correspondingly bigger, so it's easier to assemble and service. Also, the car performs closer to real life vehicles in terms of handling and is easier to see at the farthest distance of a track.

Q.

Okay, that's nice. And the drawbacks?

A.

Well, the flip side of the coin is that it's more expensive than $1/10$ - or $1/12$ -scale, maybe in terms of the kit and certainly in terms of repair costs and support equipment. Your R/C installation must be more secure and protected because the forces generated are much greater.

Q.

Are large cars harder to handle because of weight or speed?

A.

Large R/C cars are definitely easier to handle. The care should be that since the car is larger, it develops more kinetic energy than a smaller car traveling at the same speed because the larger car is heavier.

Q.

What kind of precautions can I take to insure safe operation of large cars?

A.

First, your R/C system should be in perfect working order and should be suitable for the kit you have chosen. Second, heed the kit manufacturer's instructions. If they say to use a larger R/C system, batteries and high-torque servos, then do it! Don't scrimp on the details because it may cost you the enjoyment of the kit or possibly even cause injury through misuse of the kit!

Q.

Wow. That sounds like the large R/C cars are dangerous, right?

A.

Any R/C car in any scale can be harmful if misused. Just take the proper care and you and any spectators will be assured safe enjoyment.

Q. Should I be more cautious when running a car powered by gasoline rather than by model engine fuel?

A. The thing to do is to remember that the fuel is more volatile than model engine fuel. Gasoline vaporizes faster than other fuels, so the can should be kept tightly capped and removed from direct sunlight as soon as possible to avoid "cooking" the gas. The fuel lines, fuel tank and fuel pump should be suited for pumping gasoline. This is not such a problem because airplane users have been using such equipment for years and it's readily available for this reason. Of course, no smoking, open flames or sparks should be permitted near gasoline; these warnings also apply to the use of model engine fuel.

Q. Are there any advantages to using gasoline-powered cars?

A. Such engines are easier to start and maintain than smaller R/C car engines. And the engines seem to last forever when used properly. It must be considered that many of these engines were derived from other consumer products that incorporated safety and reliability as paramount in their design.

Q. Would you say, then, that large-scale cars are ideal for beginners?

A. For an adult, it's a good and relatively inexpensive way to start out. Remember, in addition to this, you need more room to run R/C cars. Certainly, R/C cars bigger than 1/8-scale are not suitable for younger enthusiasts.

Q. Why do you say that?

A. Keep in mind that large R/C cars can be more costly to purchase and operate and that a lot of youngsters buy R/C cars through their allowance and part-time jobs. Also, a better sense of coordination and responsibility is required. Not many states allow a fourteen-year-old to drive a full-size car at highway speeds, much less own a car. Would you then give that person a model car capable of 50 mph? We doubt it.

Q. What about the small-scale R/C cars?

A. MRC/Tamiya introduced the 1/24-scale R/C road cars in response to several needs. Many apartment dwellers don't have the room even for a 1/12-scale car in their living space, let alone where to run one. Hobby shop owners don't have much space for new products or for tracks to set up for their customers. Finally, a lot of consumers get overwhelmed by the choices and combinations of car kits, R/C systems, batteries, chargers and accessory equipment. These new kits (called the Tamtech series) solve these problems by providing all these mentioned items in one small package designed to work together.

Q. It appears that 1/24-scale is too small for good speed, right?

A. No. The Tamtech cars can hit at least 18 mph in stock form!

Q. Aren't these really toy cars?

A. No, they're ready-to-assemble kits that you build and maintain. They use hobby-grade R/C systems and other components.

Q. What exactly do these Tamtech cars come with?

A. They come with a highly detailed plastic body kit, engineering plastic chassis, a miniature Black Motor powered by a 7.2-volt 270 mAh battery, 4-hour wall charger plus a two-channel R/C system with steering servo and an electronic speed control built into the receiver. The car kit can be bought separately, as can extra batteries, quick chargers and spare parts.

Q. Where can I run the large R/C cars?

A. There are a few tracks that allow these cars. Check the Track Directory to find one near you.

Q. What about the 1/24-scale Tamtech cars?

A. We're sure that many indoor tracks will have made arrangements to stage races. Since they're smaller than the present indoor racers, many present tracks will need little or no modifications. In fact, we wonder if some of the slot car track owners will welcome the Tamtech cars because of their smaller size.

Q. Hey, you didn't make any New Year's predictions! How 'bout it!

A. The first prediction is the easiest. Our hobby will keep growing because it's fun, not a fad! Two, we predict that the large and small R/C car categories will grow. Three, model fuel and gas cars will improve to the point where some of the smaller sizes will be as economical to run as the electric-powered cars. Fourth, we'll see the greater use of electronic speed controls as standard equipment in R/C system packages. Fifth, we're going to have more fun than ever before!

1/4-SCALE GRAND NATIONAL CARS

WCM Challenge Series, May 30, Clinton, Mississippi

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Track Report

Neil E. would approve



by T.J. LYN

FOR YEARS the Italians have been known for producing world class, exotic performance machines and, with the help of United Model Products*, the Coyote four-wheel-drive race car from S.G. Racing Car in Italy is no exception. The Coyote four-wheel-drive racer is designed with the seasoned R/C enthusiast in mind. That is not to say that the novice racer couldn't handle the Coyote, but this buggy is designed for world class competition, not an afternoon in the driveway or backyard.

Initial appearance of the box contents would lead someone to think that parts are missing, but this is not the case. The kit's unique packaging is the key. There are 19 steps to completing the assembly of the Coyote and each of these steps has a corresponding bag of parts that includes every component for that step. What a great time saver, and this certainly made life easy once the assembly manual was opened.

The assembly manual is in three languages—Italian, German, and English. The written description for each step is limited, however, and for that reason I believe the novice racer might need extra time to complete the assembly.

The Coyote main frame is comprised of double-upright metal chassis rails that support the mechanical units. With a gearbox on each end and the motor centrally located, you have the basis of any fine race car: excellent weight distribution. The gearboxes each house four hardened-steel gears, along with a hardened-steel drive gear and two transmission ball bearings. And by the way, the kit comes standard with ball bearings for all the critical friction points, including the wheels. When the gearbox assembly was complete, the freedom of movement in both the front and rear differentials was remarkable. It seemed as if they had already been broken-in with many hours of running time. The two differentials are connected with a single steel propeller shaft on top of which the motor gets installed running parallel with the frame rails.

Suspension on the Coyote is a double-wishbone, four-wheel system. The A-arms are made of a nylon composite that's surely one of the most durable materials to make suspension parts from. All four corners on this race car are dampened by large-bore oil-filled shocks with adjustable coil springs. The



suspension on the Coyote also allows for adjusting of camber on all four axles, to completely round out this very functional and flexible design.

The radio system and speed control unit are easily installed between the frame rails, in keeping with the excellent weight distribution of this racer. This kit's standard speed controller is a three-step-forward, one reverse and brake unit that also allows for the elimination of the radio box. This conserves weight and prevents you from purchasing an additional BEC switch for this purpose. The only component mounted outside the main frame rails, besides the suspension, is the battery pack. The Coyote is designed to use a 7.2V/1,200 mAh battery, but the best part about it is that to keep the weight as equally distributed as possible, a split pack is required. On the outside of the chassis are mounted three sub-C cells; three on each side of the chassis. They get connected by

running a lead connector over the top of the chassis; and once again the designers have maintained equal weight distribution. It works great!

As I mentioned earlier, the motor is mounted above the propeller shaft running parallel with the frame rails. It's mounted in front of the rear differential on a stationary mounting plate which allows for a pivoting slide adjustment of the motor so pinion gears can be changed and adjusted. The standard kit motor is the Mabuchi RS 540 S, which provides good out-of-the-box power. The great thing about the Coyote's motor is that you can quickly change the pinion gear without removing the entire motor; just loosen two screws and the gear can be changed. (Continued on page 82)



**PROJECT
FROG**

Radio Control
CAR ACTION

**PROJECT
FROG**

Frog Rules!



Part II

by FRED MURPHY



THERE'S A FABLE in which a frog is transformed—sound familiar?—into a prince. But this story won't be the subject of our project. Instead, Project Frog Part II deals with the transformation of a frog into a bull-frog. The goal of this mad scientist (self-styled mad scientist, that is) is to create the most mortiferous lilly-pad predator in the pond, you know, a foot-flappin' finger-snap-pin' A-number-one, green-faced, bug-eyed dictator. The project begins in my dimly lit laboratory, where the Tamiya* Frog awaits dissection.

As discussed in Project Frog Part I, the differential was a concern to be covered in this part of the project. With the stress imposed on an off-road gearbox, the fewer moving parts you have driving the wheels the better off you'll be. By replacing the stock Frog aluminum bevel-gear arrangement and the half-shafts with a fine-tooth spline, the reliability of the differential will increase greatly. With the help of Thorp Manufacturing*, this weak point in the differential can be addressed with their Dirt Burner line of R/C off-road accessories. Thorp manufactures a ball differential, No. 4500, for the Frog; and please be sure to let Thorp know

photos by LOUIS V. DeFRANCESCO JR. and A PALERMO



where you heard about this product. When installing the new differential it will be necessary to partially disassemble it, so at this point we decided to add a set of CRP* rear bearing supports, No. 1608, just to make sure that there will be no bearing play. As far as the other differential components, the 49T drive gear remains in place but for added flexibility the CRP adjustable motor mount, No. 2107, enables you to change pinion gears without changing the tooth size on the drive gear.

The only problem you'll encounter in adding this motor mount is that the stock gearbox cover, which sits opposite the motor, won't fit due to the length of the screws provided. To solve this, just get a scrap of Lexan that is left from when the body is cut-out and trim it to cover the opening in the gearbox casing, drill two 1/8-inch holes and presto, the gearbox is safe once again from dust and foreign matter. You'll also now be able to see pinion and drive gear spacing to insure good friction-free meshing. At this step in the operation we add the CRP rear skid plate, No. 3045, and the rear bumper, No. 3041, since they'll have to be attached to the gearbox housing. The differential setup is now complete.

With the reuniting of the gearbox and chassis, Parma* offers the off-roader a rear-arm-mount bushing set, No. 13001, that gives added strength to the trailer arm assembly for the roughest conditions. The trailer arms will have to be opened up a small amount to allow good movement but this is easily done with a round file in short order. As the trailer arms are put in

place make sure you install 5-millimeter ball bearings in both inner and outer positions of the arms to insure friction-free, maximum-rpm performance.

I also utilized the stock drive shafts as they are steel and of good quality and strength. When the rear assembly is finally on, Parma's positive-drive aluminum rear hubs, No. 12110, were added and the stock shocks bolted back in place. The Frog stock shocks give good response so they were maintained in our Project car.

At the other end of the chassis, the Frog undergoes a little front suspension reconstruction, a painless operation that begins with the front suspension arms. By replacing the stock arms

(Continued on page 81)



The Frog chassis after the operation is complete.

Track Report



CMW
Puma

photo by STEVE POND

FOUR-WHEEL-DRIVE NITRO BURNER!

by ART SCHROEDER

I HAD ALWAYS thought of a Puma as a four-legged member of the cat family which had power, grace, and a certain ferocious personality. A Puma was purely an animal to me! Well, that hasn't changed much as a result of doing my latest off-road project, the Flying Point Enterprises Racing Puma Pro 21 XL from CMW International*. All the perceived Puma qualities are in this car—power, grace, and as ferocious as I could ever want. This Puma has four wheels in lieu of legs, but, believe me, it's still an animal. And quite an animal at that! It's a classic mean machine.

After so many electrifying experiences with off-road vehicles, it was finally determined to allow this writer a crack at a gas-powered car. I discovered a new automotive world. Gas cars are as different from electric cars as night from day. They are heavier with more robust parts; metal frequently replaces plastic for components; parts are larger and running set-up takes more time (or it did for me). Just opening F.P.'s box is enough to make anyone realize that this one is different.

F.P.'s Racing Puma is, in the form I received, a four-wheel-drive (two differentials), front-wheel-steering, gas-powered (Enya 21 CX GM Buggy engine from Altech Marketing*), off-road machine. It should be noted that with appropriate options the car

can be built for four-wheel steering, oval-track racing, endurance car, or six-wheel off-road. You can even make it a rear-wheel drive or front-wheel drive as I found out.

Puma is made principally of a variety of metals. All gears in the differentials are of steel, the chassis is of aluminum alloy, shocks are chromium steel, and the roll cage appears to be of aluminum rod. There are 19 caged steel bearings throughout the differentials and running gear. The suspension is double wishbone, front and rear, in a glass-filled nylon. The drive shaft is straight, picking up power from a mid-mounted engine and giving a 1 to 9 gear ratio. A disc brake is incorporated in the drive shaft.

The instructions for assembly are not the greatest and they leave some vague areas. As an example, it is stated that FP-201's positioning is an adjustment for FP-305 on page 3. However, FP-201 (the full shock

assembly) is not really identified until much later in the instructions. Clutch directions give no more than assembly procedures; when it comes to adjustments, you're on your own.

There are other areas which require some thought before you proceed.

However, the isometric drawings are good and, if you follow them with a little thought and common sense, the limited verbiage won't be a problem for an experienced builder. The Puma is not a car for rank beginners either in assembly or operation.

The area with the greatest potential for foul-up (at least for me)

is the setting of the front- and rear-wheel differential cases. The isometrics show things correctly, but I missed a subtle (but extremely important) point. The ring gear (FP-206) must be on the left side of the case on the rear and right side on the front. If both end up on the same side, you have two sets of wheels driving in opposing directions.

(Continued on page 116)



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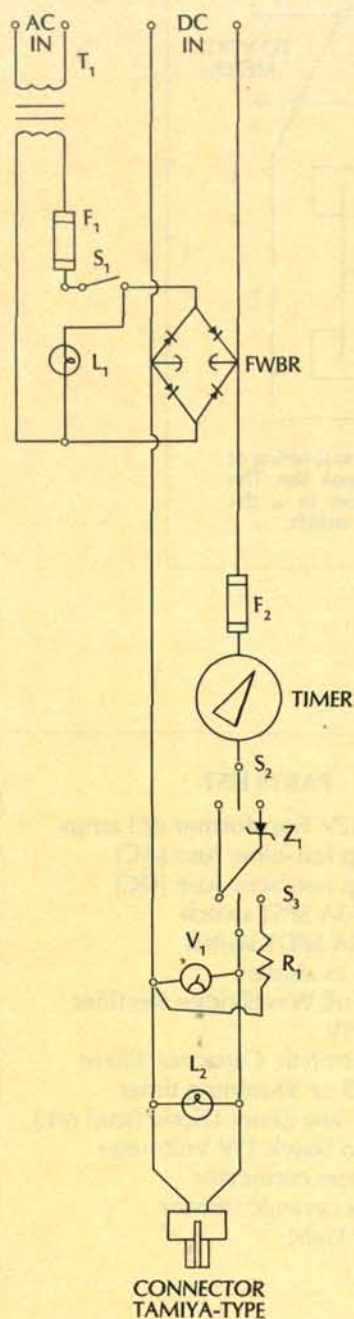
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by JOHN MUNDY

Build Your Own Quick Charger

PART II Adding more functions.

FIGURE 1



IN MY previous article in the February '87 issue of *Radio Control Car Action* I outlined how to build your own "no-frills" quick charger. Well, I had intended to just supply some additional functions to a few interested readers but I was completely swamped with letters on how to add more functions, so here they are... This issue I'll deal with three new functions: an AC power On light, a charge/discharge, and a 6/7-cell select switch.

Before going on, I must update my last article. As soon as the magazine hit the newsstands, Radio Shack discontinued the ammeter I had used for the design, and the resistor I used for the ammeter-shunt. This issue I've decided to use a Radio Shack voltmeter which I was promised would not be discontinued in the near future. As with an ammeter, you will learn where the meter will read when it (the batteries) are fully charged. This charger takes approximately 15 minutes for a 6-cell battery and 20 to 25 minutes for a 7-cell.

CONSTRUCTION. First, for those of you who have already built this charger, all these new additions basically go in series between the timer and the final output (line out to the battery) on the positive leg of the circuit. After getting all the parts together I usually lay them out and see where I'll be putting them. After that, I go ahead and drill the appropriate holes and mount the switches and light. All the wires can be attached fairly easily afterward.

In Figure 1, you can see the entire wiring diagram of the circuit. This is a way of showing how the wires are attached. A good share of the letters I received were from racers who didn't know how to read a schematic. The best way I know to explain this is to have all the components mounted and then take everything one step at a time. If you're going to hook in switch S₁, solder a lead from one end of the fuse holder and then attach the other end of the wire to one side of switch S₁. The next step would be to attach a wire to the other side of the switch and run this wire to the AC post of

the bridge rectifier.

You should have no problems with this simplistic approach to wiring the charger, but there is one area where I thought a drawing would help. Figure 2 shows the "hard part," the cell-select switch and the charge/discharge switch. If you notice, I have only one Zener diode in this circuit. This is because the store-bought chargers are all solid-state, and to do the charger we're doing in this fashion would leave out probably half of our readers due to the complexity of building printed circuit boards. So, this leaves us with trying to do it simpler and stay halfway cheap. The Zener Diode I used cost about \$5 so I only used one. The 6-cell select switch will produce about 8 volts while the 7-cell side of the switch will produce about 12 volts. In testing this charger, the design worked perfectly, so why spend the extra for two diodes?

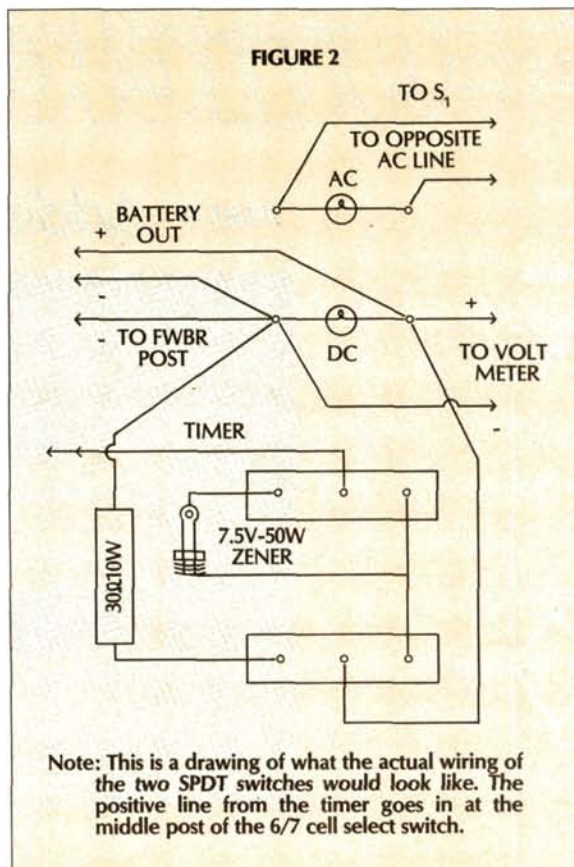
In Figure 2 you can see that the positive wire goes directly from the timer to the center post of the cell-select switch. From there, solder a wire connecting one post of the cell-select switch to the right side post of the charge/discharge switch. Next solder a lead from the other post of the cell-select switch to the Zener diode. Now bring a wire from the other end of the diode to the same post on the charge/discharge switch that you attached the other wire to. Attach one side of the resistor to the left post of the charge/discharge switch. Attach the other end of the resistor to the left side of the charge light as shown in Figure 2. Solder a wire from the right side of the charge light to the center post of the charge/discharge switch. That is the hardest part of the whole charger, so using Figure 2, attach the remaining wires (i.e., two wires to the voltmeter, two to the front for the battery) and then this part will be complete.

In some areas, the parts used in this charger might be hard to find, or just cost too much. To relieve this problem, I've talked an electronics supply store (the owner's a friend) into giving us the parts at wholesale cost! If you're interested in this, just write me a letter for the price list.

Next time I'll talk about current adjust and peak detection.

Again, if you have any questions please feel free to write, I will try to respond as quickly as I can, just be sure to include a self-addressed stamped envelope.

John Mundy, c/o *Radio Control Car Action*, 632 Danbury Rd., Wilton, CT 06897.



PARTS LIST

1. T₁—120/12V Transformer @3 amps
2. F₁—4-amp fast-blow fuse (AC)
3. F₂—8-amp fast-blow fuse (DC)
4. S₁—120V-3A SPST switch
5. S₂—12V-3A SPDT switch
6. S₃—same as above
7. FWBR—Full Wave Bridge Rectifier 25A/50 PIV
8. Cap.—Electrolytic Capacitor 100mf
9. Timer—15 or 30-minute timer
10. Z₁—7.5V/50w Zener Diode (stud mt.)
11. V₁—Radio Shack 15V Voltmeter
12. Tamiya-type connector
13. 30Ω/10 w ceramic resistor
14. L_{1,2}—12V Light

IRVINE 21-RE-ABC

(Continued from page 52)

reason, pistons and liners are made in matched pairs and it is usual for the cylinder bore to be slightly tapered so that maximum compression seal is reached toward the top of the stroke, while keeping frictional losses to a minimum over the remainder of the cycle.

The 21R's brass cylinder has a generous wall thickness of 0.08 in. (2.0 mm) which has the advantage of offering more effective directional control of the gas flow through the ports. The latter, as is usual with a Schnuerle-plus-third-port scavenging system, consists of an inlet port on each side, angled to direct mixture to the front of the cylinder, diametrically opposite the exhaust port, where there is a steeply inclined third port designed to sweep the charge upward. Gas transfer periods, as measured on the engine examined, were 132° of crank rotation for the two side ports and 122° of crank rotation for the third port. The exhaust period checked out at 162°, which is a reasonable compromise, allowing the stock engine to be operated effectively with or without a tuned muffler system.

The piston is coupled to a new machined conrod of hefty proportions (necessary to withstand the very high revolutions of which the Irvine 21R engines are capable) and having a bronze-bushed lower bearing. The piston has the usual flat crown and is used in conjunction with a cylinder-head that has a deep, small diameter part-spherical combustion chamber, surrounded by a wide (3.1 mm) slightly sloped squish-band.

The special heat-sink type head, exclusive to the car version of the engine, is of machined bar stock aluminum with six fins of just under 1 3/4 in. diameter. It is equipped with a 0.005 in. copper gasket and is held down with six hexagon socket head cap screws. Also of machined bar stock are the backplate (fitted to the crankcase with an O-ring rather than a paper gasket) and the exhaust stub which has two external O-rings to suit a 5/8 in. or 16 mm i.d. exhaust pipe or muffler adaptor. All the socket head cap screws securing these parts are the familiar 4-40 size rather than the metric sizes used for most other imported engines.

Irvine Engines sales in the U.S. are through Great Planes Model Distributors, who also handle parts and service.

Peter Chinn, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897. ■

ALIEN

(Continued from page 33)

rear drive units are then attached to the main chassis. The instructions then focus on the steering apparatus, which requires that you first assemble the servo-saver. I found this to be a tedious task—due to the tendency of the servo saver spring to take flight during assembly, rebound off the wall, and then nestle itself directly under the center of the workbench!

Once the servo-saver assembly is complete, there is one more step that needs attention. Upon mounting the steering servo, the instructions recommend using only one layer of two-sided tape to hold the steering servo in place. I, however, recommend doubling this to keep the servo saver from hitting the chassis after the servo is cinched down with a zip tie.

Next is the assembly of the suspension components and shock absorbers followed by the installation of the motor and pinion gear. Pinions are fully covered in the performance section of this article.

The last few steps are to mount the radio system, tires, and paint the body. Take some time to complete the painting—use laquer—and this body will turn some heads at the track.

PERFORMANCE. In the back of the instruction manual there's a section that will shed a little light on how to adjust the suspension most effectively. The manual is informative, but I'll also describe for you my own *Alien*, if you will, experiences.

Cornering under acceleration promoted a little understeer, but as you ease off the throttle the front tires give more bite. This is with a little positive camber in the rear and some negative camber in front. A little toe-in up front will give more straight-line stability.

When adjusting the shocks, you want to take into account the kind of terrain you'll be running on. I found the most effective setting is when the adjustable collars are a little less than 1/4 inch from the top of the shock for relatively smooth terrain. As you encounter more difficult surfaces, you'll have to readjust accordingly. Because Hirobo elected to use a metal piston inside the shocks, the operation will seem a little uneasy at first. But do not fear, this requires a short break-in period, just as with other cars, to loosen things up a bit.

Now for the motor and pinion. The

(Continued on page 82)

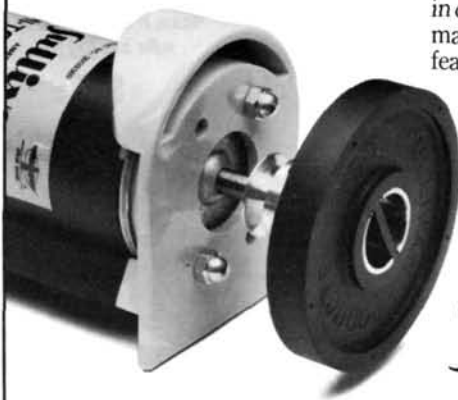
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PROJECT FROG

(Continued from page 68)

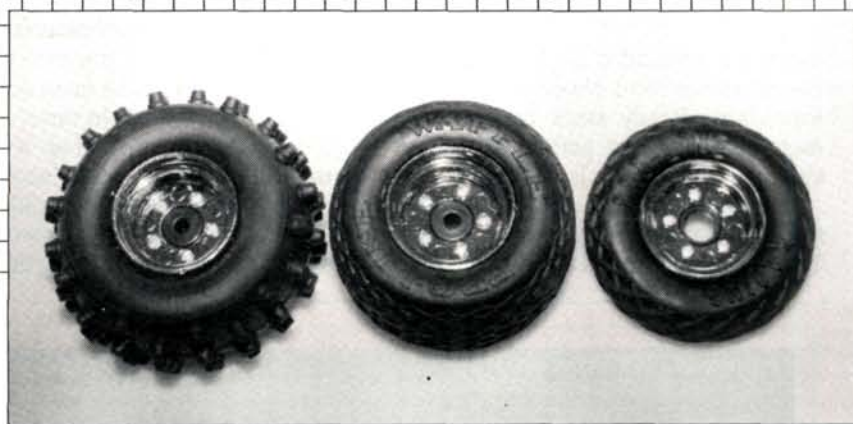
with CRP's front suspension arms, No. 1607, the lateral play that many Frog suspensions have can be eliminated. Keep in mind that you'll need two sets; and by using shims with these parts, any play that remains can be totally removed. And CRP does have shims, No. 2521, for just this purpose.

If you decided to use front shocks, as I did, make sure you remove the piston and spring assembly that is mounted in the stock Frog chassis to insure that the shocks will perform properly. At this point I added the Pro-Line* Frog bumper, which provides complete front-end protection with tire-to-tire coverage. The front shock kit used is the CRP No. 1601; its coil-over design gives great independent adjustment to accommodate all track or street conditions.

To complete the front suspension changes, under the chassis the stock skid plate is replaced with a CRP No. 3043 chassis stiffener and skid plate for added strength and protection.

The next area of attack: the steering is easily beefed-up from mere frog's legs by using a Parma No. 12827 tierod set—or by referring to the steering article in this issue for some handy tips.

The power in Project Frog is controlled by using the Parma 11515 speed control, the same used in Project Grasshopper, but without reverse this time. The speed control fits with only minor modification—place the steering servo where the stock speed control servo originally went, in the



Pro-Line offers rear spikes and the new waffle tread design for front and rear.

right-hand mount, and reverse the steering linkage so the short steering arm is connected to the right front wheel. The Parma speed control also allows the elimination of the radio box to conserve weight. Mount the receiver switch on an open frame rail with a piece of double-

gear, Parma's 6-cell matched Sanyos, No. 11250, and what we got was *Speed!* The battery is held in place with the CRP No. 2523 battery-door clip, which has a quick-release handle for easy changes.

Out-of-water-wear for our amphibious



The Team Losi Revolution II motor is a true two-wheel-drive performer.



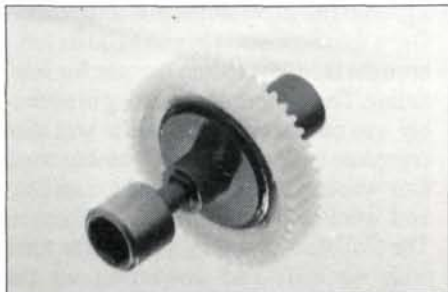
Addition of CRP front shocks with adjustable coil-over springs gave Frog great jumping ability.

sided servo tape and position the receiver on top of the chassis where the driver of the stock Frog would be mounted.

With all internal organs in place, the Frog awaits its powerplant. The RPS* Revolution Series two-wheel-drive motor was chosen to get the little beastly hopping. To this we attached a 19-tooth pinion

annihilator is a pair of Pro-Line rear spiked tires and a set of Pro-Line front tires, all mounted on a regal set of gold two-piece wheels. The rubber is held in place with a set of Pro-Line spinner Knock-offs as the final dapperly touch. And don't forget to install a set of 5-

(Continued on page 126)



Thorpe's dirt burner differential is the Frog gear-box solution.



CRP suspension arms eliminate front-end play and greatly improve handling.



CRP has available a combination front skid plate and chassis stiffener.

ALIEN

(Continued from page 79)

motor that's included in the kit does this car no justice. So I chose to install the formidable Reedy stock classification motor to bring the performance level closer to what the car is capable of.

Choosing a pinion gear gets a little sticky. With the Reedy stocker and the 15-tooth pinion I found that the Alien had

very good acceleration but suffered in the top end, rendering a run time of 7-plus minutes. This would be more suitable for a small track with tight turns. With the 17-tooth pinion I picked up a little top end without losing much acceleration, with a run time of 6 minutes, 30 seconds. The 19-tooth pinion I found worked out best for competition, offering the highest

top speed while still allowing the car to complete the 4-minute heat run—time was 4 minutes, 30 seconds.

Once I got all this sorted out, I found the Alien was a great performer! Throttle response was very good and there was little evidence of roll even in the tight turns. Once again, the Alien doesn't have a rear wing or anti-roll bar. The only thing I found that the Alien could really use is a larger front bumper. As you start to reach the speeds necessary for competitive racing, you also run the risk of more serious damage. With proper set-up and break-in, the Alien is a great-running car, and if you choose not to buy one, don't be surprised to see a far-out creature nipping at your heels!

**The following are the addresses of the manufacturers mentioned in this article:*

GMP, Gorham Model Products, 23961 Craftsman Rd., Calabasas, CA 91302.

Futaba Corp. of America, 555 W. Victoria, Compton, CA 90220.

COYOTE

(Continued from page 64)

The Coyote is finished by mounting the four big-diameter (52 mm), ultralight-weight hubs and low-profile spiked tires, sealing the under-chassis with a Lexan dust protector and topping it all off with a sleek polycarbonate body. With final assembly complete and before track-testing the Coyote, I did a final component check in which I discovered what at first I thought was excessive play in all four wheels. My first impression was that the clearance between the half shafts and wheel bearings was off, but after consulting United Model Products technical staff I soon learned that the play was a part of the bearing design, something that was normal and wouldn't affect performance. You'll see that it doesn't.

So, with a radio in hand I hit the dirt and made an attempt to wear down this wild dog. The Coyote's initial performance was great, but the suspension needed a good break-in before the true competition. Once the suspension began to do its job, I brought the Coyote into the pits for fine-tuning. The camber angle setting in assembly was zero and since break-in was then complete I added about 4° camber to all four wheels, double-checked toe settings and went back out. What a difference! The Coyote was pulling through the turns with no drift and devouring up the straights like real performer. But what about the Coyote's performance with more

(Continued from page 98)



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Spoiled

BRAT

by ERIC GOLDSCHRAFE

EVER RUN DOOR-HANDLE to door-handle with another car into the last turn and nail the throttle only to have your car quit cold, a victim of dirt in the speed control? Have you ever saved up for months to buy a car, and before you even get it finished somebody comes out with a new model that's supposed to make yours obsolete? Things like this make dirt-track racing more of a challenge than it should be, and take a lot of the fun out of the sport. While the car in this

article doesn't pretend to be a world-beater, though it is very competitive, it does have a few features for better performance.

Many organizations utilize an oval dirt-track format as a substitute for a full off-road course because a suitable piece of ground isn't available to build a track on, and others do it because that's where the interest is. Dirt oval tracks have been around since cars were invented, and it's practically a North American tradition that the current crop of auto-racing

superstars, as well as previous generations, got their start on the dirt bull-rings all over the country. With no intention of putting down the off-road racers, many R/C drivers feel that dirt-oval racing is a lot more realistic and requires more set-up and driving skill.

Sure, you can take any off-road car and go dirt-oval racing, but there's lots of room for improvement. You can lower it to get the center of gravity closer to the ground (you won't need all of that clearance), and you can try



Completed ready-to-run chassis with body removed.

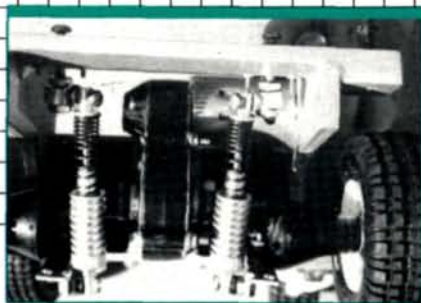


This pile of used Frog parts and a few pieces of wood will make a darn-good race car.

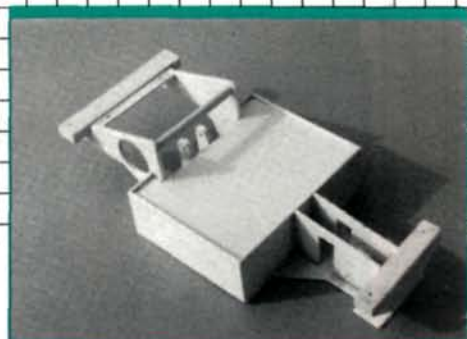
different spring and shock combinations. That's about all you can do with most cars, but it's definitely a step in the right direction. Even using a stocker body isn't easy because most off-road chassis are too short in the wheelbase department, and trimming one of the "fender car" bodies to fit makes it look like one of those mid-1960s altered-wheelbase funny cars used on dragstrips.

Although this article is directed at the popular MRC/Tamiya* Brat and Frog owners, those with other makes may take a few liberties with the design, and make it fit their own hardware. Just about any car will work with only a couple of changes.

The basic concept is a throwback to the original off-road cars, the Tamiya Sand Scorchers and Baja Bug, which were a good design because all you had to do after a day's racing was pop off the body and hose everything down—the R/C and equipment box sealed out dirt and water. This design also puts all of that expensive radio gear in a box, but more room inside gives you a lot more latitude in component placement, for



Jacking mechanism raises or lowers mounting of spring/shock combination by turning long bolts with screwdriver.

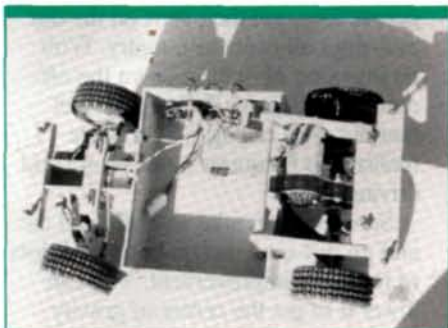


Plywood structure ready for a coat of paint and suspension hardware assemblies.

reasons we'll get to later. The basic chassis is constructed of 1/8-inch aircraft plywood (available in most any hobby shop), and despite its larger size, is lighter than the stock Brat/Frog chassis. The various wood pieces were sanded smooth after being cut out with an X-Acto knife, spot-glued with ACC cement, and firmly secured with a bead of five-minute epoxy along all joints. The entire front and rear suspension assem-



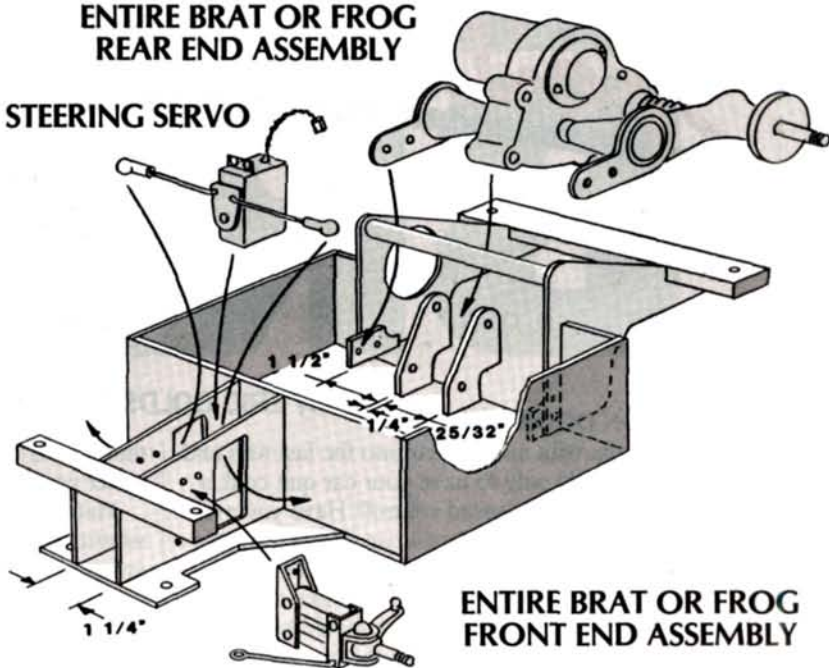
Top view of jacking bolt installation, showing captive locknuts.



Top view of completed chassis with R/C gear installed.

ENTIRE BRAT OR FROG REAR END ASSEMBLY

STEERING SERVO



ENTIRE BRAT OR FROG FRONT END ASSEMBLY

blies and the motor/transmission module mount to this chassis with no modifications, allowing reversion back to the stock chassis anytime you desire. Minor bracket changes will allow other spring/shock units to be used.

A set of Sand Scorchers short shocks were attached to the front end with a small bracket, using the existing unused hole in the upright and some #2-56 bolts, nuts, and washers. A larger hole fits tightly over the existing nut on the lower control arm bolt, locking this flat bracket in place. A set of coil springs of the proper size was fitted to make coil-overs out of these plain shocks. Stock Frog coil-overs were used in the

(Continued on page 112)

Aerodynamics

by RICH HEMSTREET

FOR R/C RACERS, the two most important aspects of aerodynamics are drag and lift/downforce. In Part I of this series (*Radio Control Car Action*, April '87 issue) we looked at some of the technical information about aerodynamics. Now let's look at some of the practical things that can be done to improve the aerodynamics of your race car.

First, mount the car body as low as possible. Be sure to leave room for suspension travel, but don't leave any extra room. With electric cars, try not to let the body drag on the racing surface, or it will waste battery power. By mounting the body low, you'll reduce the frontal area (drag) of your racer. Lift will also be decreased by reducing the amount of air that goes under the car.

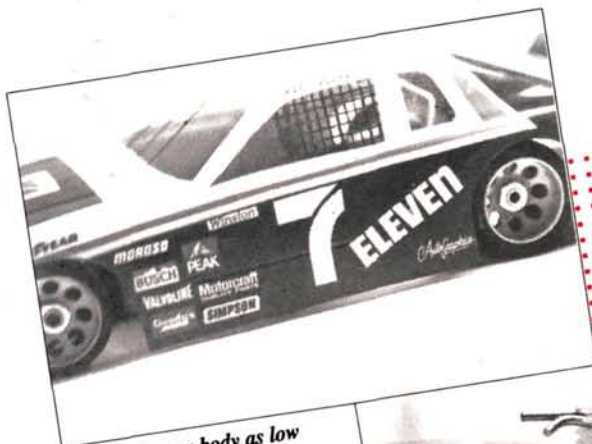
Next, shorten the body posts so that very little of the post extends above the car's body. This will reduce drag by cutting down on air turbulence around the posts. In some cases, frontal area will also be decreased.

Mount the car cleanly, with only the necessary holes drilled in the body. Extra holes from different body mount locations will usually create drag from airflow disturbance. If the extra holes are on a trailing body surface (i.e., rear window of Ford T-Bird), it may help reduce lift by letting air escape from under the car. This is a good reason for mounting your antenna as far back on the car as possible so the hole can release air from beneath the body. The worst place to mount an antenna is to have it come through the windshield, which would permit the air to enter the car and become trapped inside, creating both drag and lift.

If it's legal, remove the entire rear body panel of your car. This reduces drag and lift by permitting the air under the car to exit freely.

Try to have the front of your racer as close to the track surface as you can

Lower means less drag.



Mount the car body as low as possible to improve aerodynamics.



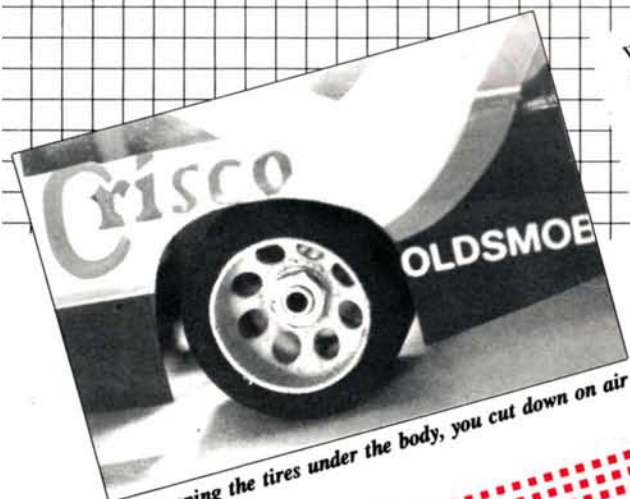
This body post is too tall and will increase drag.



When legal, remove the rear body panel to let air escape from inside the car.



Keep the nose of your racer close to the track surface to reduce lift and drag.



By keeping the tires under the body, you cut down on air turbulence.

without scraping. This will keep air out from under the car, once again reducing lift and drag.

Finally, don't enlarge the wheel wells too much. Keep the tires under the body and have small wheel well openings. This once again will help to decrease drag by cutting down on air turbulence around the tires.

By following these guidelines, it's possible for you to have a car with better aerodynamics than another identical body.

In Part III of this series I'll look at ways to increase downforce on your racer for better handling.

Rich Hemstreet, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

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McAllister
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Race Strategy

by DICK BRINTON



Good line and setup are crucial for a good jump. Note center photo, car has a good nose-high attitude. Other cars show less desirable attitudes.

A COUPLE of weeks ago I was watching the other classes run and I was amazed at the number of drivers who had single car crashes. These weren't beginners classes, and the crashes didn't involve other traffic or drivers trying to pass some other car. The drivers were just trying to drive their own cars around the course and some of them were having a lot of trouble.

I asked around during the lunch break and found a number of drivers who said they sometimes had trouble seeing where their cars were in relationship with other cars because of a turn, a hole in the track, etc.

When I do my walk around the track before the start of the races (see "Racing, Race Strategy, and Practicing to Win" in the February '87 issue of *Radio Control Car Action* and "Race Strategy, Part II" in the April '87 issue) I note not only the line I want to drive, but I also make a mental note of shut-off points. These are the places where I get off the throttle and on the brakes to set up the turn. In addition, I establish in my mind the position of markers that I use to help me keep my car on the line I've chosen.

To illustrate: Sometimes a track winds pretty far away from the drivers' stand, making it hard to see exactly where your car is. This is an area where a marker, a

reference point, is badly needed. Look for something that stands out when you're on the drivers' stand. It can be patch of grass, a lighter streak in the track surface, a rock alongside, a bump, a catch fence—you get the idea—then decide where you want your car to be in relation to the marker.

As a side benefit, you'll help develop your wide-angle vision as you become aware of markers as they appear in the corners of your eyes.

During the heat races, use the markers to help you. If you find you need more at some point, add them to your list. As a matter of fact, when you first start doing this, it helps if you write them down. For



Good car placement, exceptionally clean and rare first turn.



Typical first turn disaster.



Dogging the rival w many times force an error.

instance: Turn No. 1—car goes just outside the tuft of grass.

You'll find a marker necessary on most of the turns and straights that are away from the drivers' stand and very helpful on some closer sections.

Straights, too? You bet. About one-fourth of the crashes I saw occurred on a long, narrow, back straight. Cars would start out with a good line, wander to one side or the other, and hit the outside catch fence or the steep inside berm. Either resulted in a crash.

If I drove my car so that its wheels were just visible over the top of the inside berm, I stayed centered on this straight, and I could run down it at full throttle.

This illustrates another reason to always drive from the drivers' stand. Things look different from there. If you're able, try to stand in approximately the same place on the drivers' stand for all your races. Sometimes perspective changes a lot from one end of the stand to the other.

Eventually you're going to catch up with another car and have to pass it, a skill anyone can develop. Here are a few rules to use to get started on the right foot.

1. Don't use the hacker's method of

passing. That is, don't ram the other car. Sometimes the other car comes out best and, if you use this method regularly, you'll beat up your car needlessly. Besides, it's just not a neat way to pass. It proclaims, "I can't get around a car with style, so I hack." A clean pass is very satisfying, especially when you pull it on a tough rival!

2. You must develop wide-angle vision to be good at passing. You can't set up a pass if you can't see the other car.

3. You must execute the pass in a way that gets you past the other car in the least time. The longer you stay alongside, the more chance there is for a collision.

4. You should be aware of where you are in the race. If you know you're in second place and the race is only half over, you have a lot of time to set up the pass. If you're at the end of the race and another car is breathing down your back, you have to hurry things along, but you must avoid panic passing.

5. After you make a successful pass, don't lose your concentration or you'll make a mistake and be back where you were...or even worse.

I won't spend time on the easy passes; you know, the ones where the other car is

in the catch fence, or slides off the track or is so slow you just breeze by.

Let's look at the case where the race about half over, your car is in second place and you've got some space on the car in third place. How do you know this? By being aware.

Each time your car passes the Start/Finish line, count off another lap. It doesn't have to be a really accurate count; you only want to know approximately where you are in the race. If your class has been turning 14 laps in 4 minutes, when you reach 7 laps, you're about halfway.

At some tracks, the time is announced at 2 minutes, then again with 30 seconds to go. Whatever the scheme, use some method to know approximately where you are in the timing of the race.

It's a bit tougher to know what your standing is in any particular race, especially if you've been driving poorly, just been involved in a number of crashes. When you're running clean, you usually have a pretty good idea who's ahead of anyone, and how close the next-place car is. Running clean helps a driver concentrate; crashing, hacking, spinning out, or fouling up concentration.

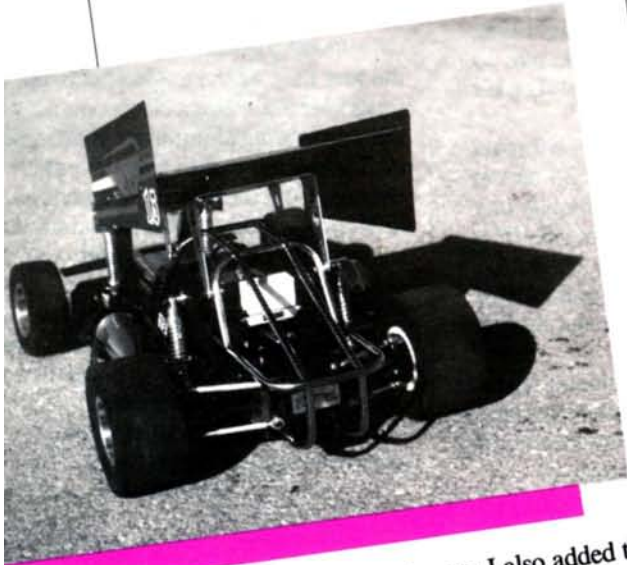
(Continued on page 106)

The use of landmarks helps to place car at a distance. Here, car is positioned between inside berm and hose.



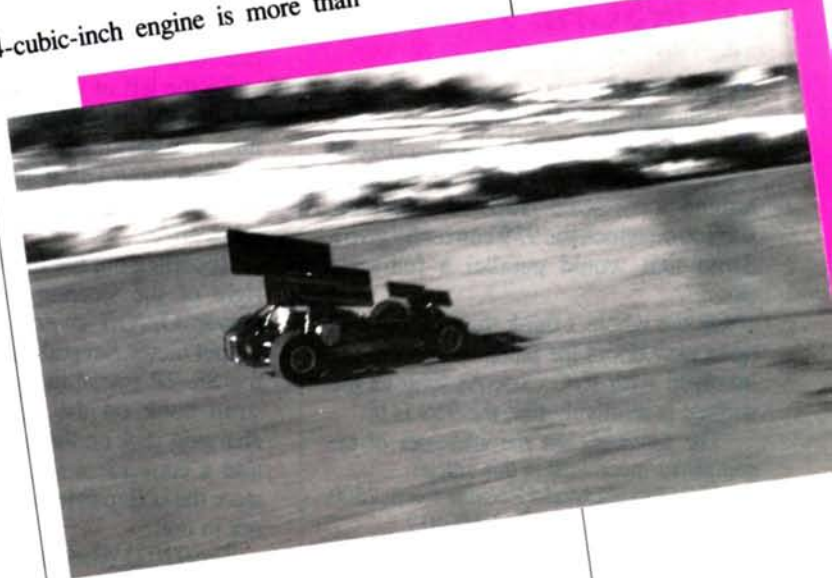
powerplant. While the Zenoah Max-Power 1.4-cubic-inch engine is more than enough power for some, those of you out there with an anchor on your trigger finger might want a little *hare-ier* powerplant.

More power is available through Raco accessories. First, we'll start with the high-rpm main jet. I've got to admit, at first I was a little leary about opening up the carburetor but with the clear instructions that were included the process was a breeze. While



reinstalling the carburetor I also added the K&N* Maxi-Filter for better breathing. To complement the intake changes I also added the tuned expansion chamber with nerf bars; and this accomplished two things—increased horsepower and protection of suspension components.

Now that the Rabbit has its incisors ready for the bite, let's consider its appearance: nothing brings out the esthetics of a car more than a custom-painted body. With the clear Lexan body this can easily be



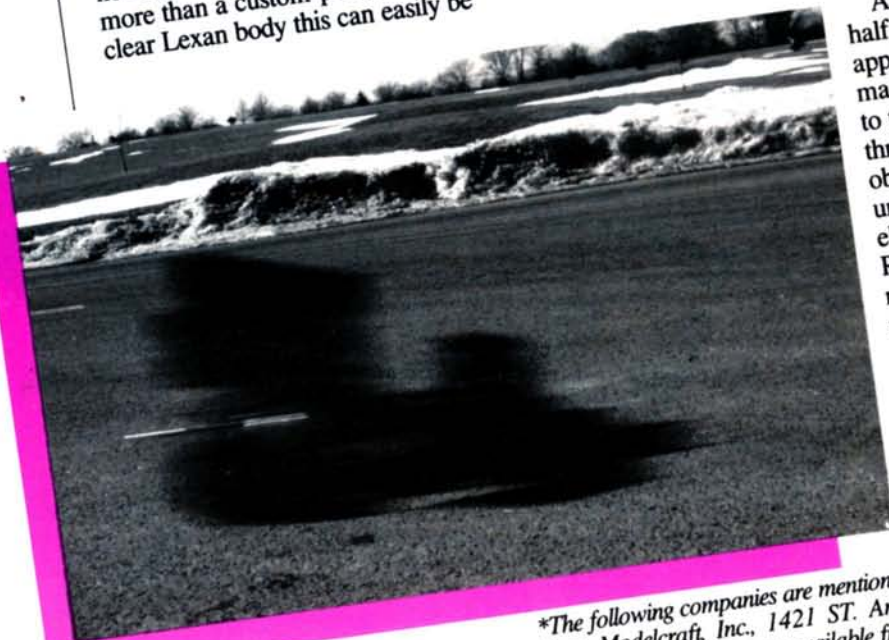
accomplished with either aerosol sprays or airbrush. Polished aluminum rims and chassis make for a smart little critter that's a *hare-raising* sight!

Off to the test track—where I found that by using the K&N Maxi-Filter you lose the choke; but by sliding off the filter and cupping your hand over the adapter, the engine is easy to start (within two pulls).

Once the Rabbit roared, with its cocky ears up, the engine modifications became evident and the animal's idle had to be tuned down a bit. After a little warm-up, it was time to test the power so I hammered the trigger and the Rabbit sprung into action accelerating furiously against the oncoming terrain, kicking up debris from its hairy monster rear knobbies! The power increase was substantial, like a Rabbit fed Wheaties. Low-end acceleration drastically improved with instantaneous throttle-response and enough power to rip-up the ground at the squeeze of a trigger.

After running it for a half hour or so it was apparent that this machine was designed to take abuse going through ruts and obstacles that could undo the 1/10-scale electrics I've run. The Rabbit even barrel-rolled at speed and repelled injury.

The Jack Rabbit makes a great off-roader and the Roadrunner version is the ultimate pavement machine.



*The following companies are mentioned in this article:
Raco Modelcraft, Inc., 1421 ST. Andrews Place, Santa Ana, CA 92705. K&N Products are available from your local auto parts dealer. ■

PORSCHE 959

(Continued from page 46)

rounds the tight turns.

Although the 959 is very much at home on the standard 1/10-scale off-road track, it's a heck of a lot of fun to throw around a 1/12-scale carpeted track, the surface on which the 959 can really give a demo that would parallel a full-scale event.

On the whole, I think that this car will open new doors for those wishing to get involved with R/C cars. As long as the surface is relatively flat, the 959 is go.

*The following are the addresses of the companies mentioned in this article:

MRC/Tamiya, Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817.

Futaba Corp. of America, 555 W. Victoria, Compton, CA 90220. ■

AIRTRONICS SR-2P

(Continued from page 19)

to be optimized for a particular application. This will be available on all production models. My prototype transmitter had a fixed throttle travel adjustment set at 70% forward and 30% reverse, which worked out just

fine for my evaluation.

To the left of the steering wheel is the throttle trim control. This adjustment can vary the throttle servo center position about 18°, which can be used to set the point where braking action takes effect.

Rounding out the front panel to the right of the steering wheel are the power On/Off switch and the RF output meter. Several other features of the SR-2P transmitter are the safety strap hook on the left side, Ni-Cd charging jack on the upper right side, and a convenient slot on the rear to store the collapsible antenna when it's not in use.

The 92021 receiver is very compact and lightweight, and the 635 servos are husky enough for practically any car or boat application. The SR-2P is shipped dry and can use either AA alkaline or Ni-Cd batteries, although if Ni-Cds are used, you'll need a charger as mentioned earlier.

Airtronics has another winner on their hands. The transmitter feels comfortable in use, sells for an attractive price, and has an excellent 12-month warranty.

Charlie Kenney, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

*The following is the address of the company any mentioned in this article:

Airtronics, 11 Autry, Irvine, CA 92718. ■

Important Notice: As of June 1, the Airtronics SR-2P radio will be designated the Vector 2P. The only change will be the addition of a throttle adjustment control.

IRVINE 21-RE-ABC

(Continued from page 29)

the fact that, as the engine heats up, the brass liner maintains a closer contact with the surrounding aluminum cylinder jacket. The engine is also less susceptible to damage if overheated by a lean run, as the liner more readily expands to maintain a running fit between its wall and the piston.

It is, of course, vitally important, with an ABC setup, that the piston is very accurately fitted to the cylinder bore in order to maintain compression without the excessive tightness that would absorb power through increased friction. For this

(Continued on page 79)

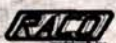
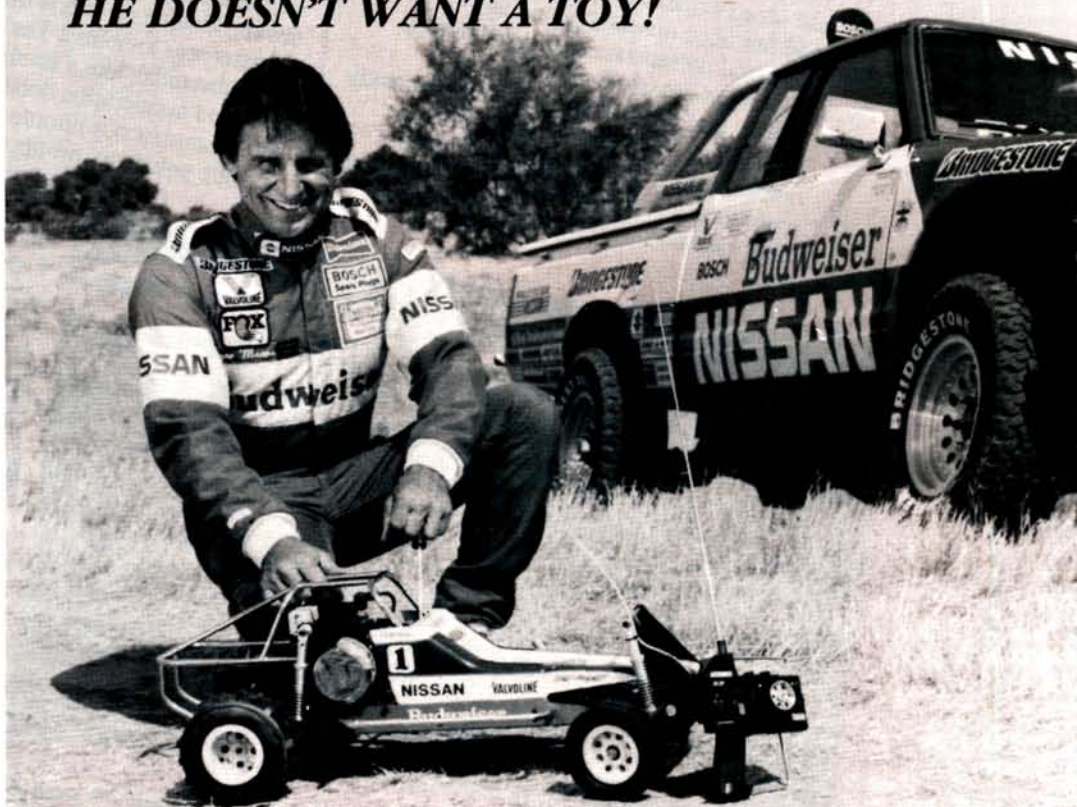
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Troubleshooting

by FRED MURPHY

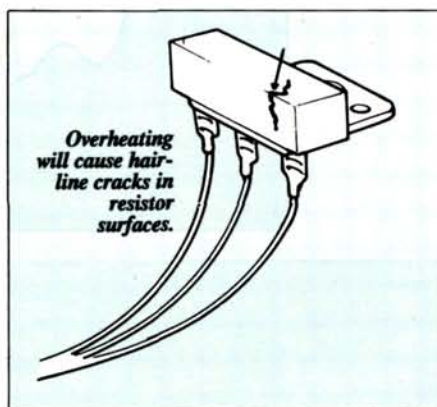
Big headache cure for a small price.

MOST R/C modelers, both novice and expert alike, experience problems with their cars and often times cannot put their finger on the answer.

After sifting through the mail bag since the last issue, and keeping my ear low to the ground, a common question seems to be rising to the top of the list: why after running my car for a while does it suddenly not have proper speed response (no lower speeds, no high speed and/or no reverse)? Or before my last battery charge everything was fine and now there's no lower speed, no high speed and/or no reverse.

I know this could be the sign of many different problems with many different solutions, but my experience shows that nine times out of ten this symptom has about a \$2 cure.

Just about every car has a type of resistance device in its system somewhere. Most systems use what is known as a ceramic heat resistor which is designed to resist excess voltage. The resistor usually is between the speed controller and the motor, in this case it prevents excess electrical current from



reaching the motor and permanently causing damage to it. The resistor acts similarly to a radiator in a full-size automobile, it gives out heat. This is why most decal packages supplied with kits have a decal to place near the resistor which says, "Hot Do Not Touch!"

Inside a resistor is a thin wire that the electrical current flows through. It is similar to the filament in a light bulb and when it breaks or burns out the voltage can no longer pass through it. When voltage can no longer pass through this wire certain current is restricted from reaching the motor. That current may be low voltage to make the motor turn slow, or high voltage to make the motor turn

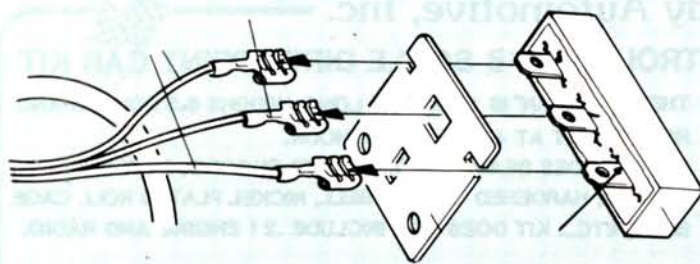
fast. Your car may have two resistors or it may have only one, but they perform the same task.

If you take a close look at one of these resistors you'll notice it is a porous material and seems rather brittle. In fact, it is very brittle. When your car has a crash, resistors are susceptible to damage. They can even be damaged when they get too hot. This damage will most likely show up as a hair-line crack on one of the resistor surfaces.

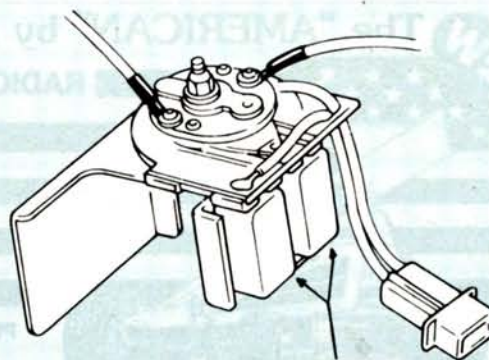
The other area to inspect for resistor damage is at the connection point if you have a prong-type connection. Sometimes force on the resistor wires of these connections bends the prong, and it in turn cracks the resistor surface or breaks its contact with the wire inside the resistor.

Another sure-fire way to ruin a resistor is to get it wet when it's very hot. Keep in mind that a resistor will get the hottest when you're running at low speeds, because it is resisting more voltage than if you're running full-throttle.

The question now is, "Why did it get damaged?" You know that you didn't hit anything or that no water got on the resistor. "What happened?" Chances are that there is some sort of extra stress being



Forcing connectors onto posts will damage resistor. Examine posts in area indicated.

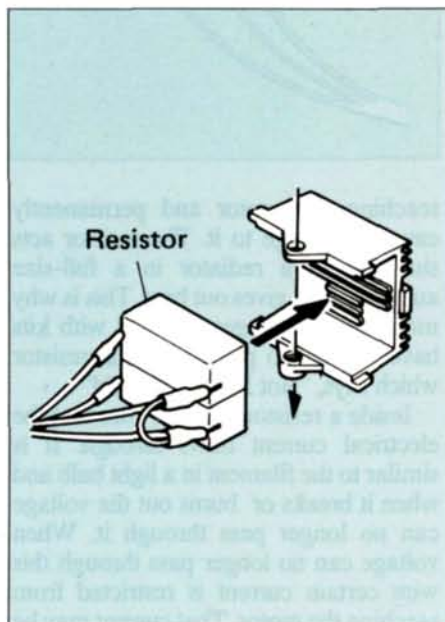
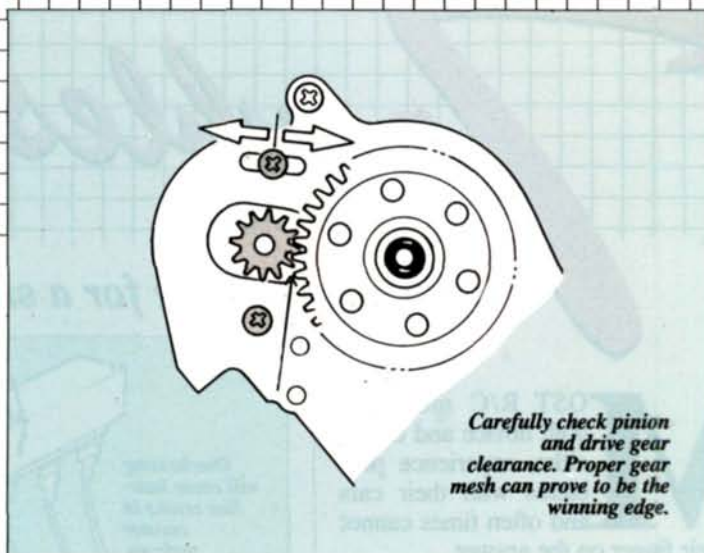


Marui-type speed control with built-in double resistors. Remove for better view when checking for damage.

placed on the electrical system. Check wheel and gear box movement to make sure that everything is moving without restriction. Are there any obstructions in the axle area, such as mud or grass packed around the drive shafts or axle housing? Are the gears binding? They should move freely without having to place a lot of effort into making them turn. Maybe it's time to rebuild that gear box. Many of the fiber/plastic gears in use today do not last forever despite what your friends might tell you.

Another area to take a close look at is any place you have two surfaces making contact with each other, such as axle bushings or axle ball bearings. Ball bearings need to be cared for. They need to be oiled and cleaned. They may appear to be sealed, but dust, dirt, and water can damage them very easily if they're not properly maintained. A seized bearing can not only lead to resistor damage but, even worse, to gears and motors.

Many racing machines on the market allow for the changing of pinion gears and their motor mounts allow you to then reposition the motor to compensate for the change. Make sure that the meshing of the pinion and drive gear is smooth, not dragging or binding. There should be enough clearance between the gears to allow you to freely rotate the drive wheels without making the motor sound like it's screaming for help. Most kits provide a thin plastic film for use in setting this



Marui, Samurai resistors. Remove resistor cover for proper inspection.

clearance. But if they don't, or if this area in your kit is sealed in such a way that you cannot place anything between the gears to measure clearance, then be very careful that the movement is not impeded.

It's not good to have either too little clearance or too much, but if I had my choice, too much is probably less damaging than not enough. It's less expensive to replace a pinion gear and a drive gear than it is to replace a motor.

Resistors serve a very useful part in a radio-controlled vehicle. Without them, repair bills could be sky-high. For just about \$2 most of our problems can be solved.

So look to the resistor for the answer or the solution if need be. But remember, look closely; sometimes a crack in this inexpensive part can be hard to see at first glance.

Good luck and happy motoring!

Fred Murphy, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

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

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COYOTE

(Continued from page 82)

than just an RS 540 S?

UMP has a series of electric motors—the Dymond racing motor—of which I chose a red label model with two ball bearings, double-wound .022-gauge wire and epoxy-coated hard brushes. The Super Sprint motor I put in was really too much, at 28,000 rpm, but why not! With the powerplant in place, back to the dirt I went. A land missile! *Wow!* that boy tore up the ground like a famished wolf feasting. What fun, powering through the turns and throttling down the straights—pure exhilaration! UMP could very well have a real winner on their hands, a well-bred rascal.

With fine suspension detail, excellent weight distribution, and virtually unlimited power potential, you'll be able to make some feathers fly.

**The following is the address of the company mentioned in this article:*

United Model Products, division of United Model Dist., 301 Holbrook Dr., Wheeling, IL 60090. ■

GP-10

(Continued from page 26)

their test track? With some furthering, a source at MRP finally gave answer. The car we saw was a pre of the new MRP GP-10, a 1/10 circuit racer.

The GP-10 will feature full ballings, a fully adjustable ball differ and hydraulic dampers. To the best source's knowledge, the chassis components will be made from T-6 aluminum and fiberglass, and the kit will come with rims and tires. The kit will feature a Lamborghini C-2 on-road body as a stock item, but the other MRP 1/10-bodies will be available and will mount on the GP-10 chassis. We understand that the Lamborghini C-2 is the latest of the Italian supercars now competing on the 1987 IMSA and W Endurance Cup circuits, so the MRP 1/12 or 1/8 version of this mighty machine will have you in the most up-to-wrapper available.

The GP-10 is kit No. 31-1200, will be shipped without electrics, motor or speed control, and of course with radio. It will accept either a resistor

(Continued on page 101)

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GP-10

Continued from page 98)

electronic speed control and any .05 ohm resistor. The kit will be available through your nearest MRP dealer.

With the popularity of 1/10-scale on-road racing growing across the country, whether it be on carpet indoors or on pavement outdoors, MRP expects the GP-10 to set new track records. The prototype we observed certainly was slick, but availability to the consumer will be the real test and that is just what we asked MRP: when can the public expect to see this happen? Well, the GP-10 is planned to be shipped around the end of the first week in April, which is about the time you'll be reading this article. MRP has also insured us that by the time the next issue of *Radio Control Car Action* is in your hands, the GP-10 will be available to us so that we can give you the in-depth report and track test you want. So, until then, we will keep our ears close to the ground and make sure that *Radio Control Car Action* readers are the first to have the hottest tips and product news available.

*The following is the address of the company mentioned in this article:

Model Racing Products, 18676 142nd Ave., NE, Woodinville, WA 98072. ■

JEEP

(Continued from page 34)

Since these components are already assembled and installed, all you have to do is follow the 6 basic stages to have your CJ-7 Laredo ready to go. Stages 1 through 3 involve installing the radio system, and stages 4 through 6 are bodywork and final appearance stages. With the help of PIC* Plasti-Stic, the body components such as lights and detail items are securely attached. That's all there is to it, a ready-to-run, fun-in-the-sun vehicle.

Driving the Jeep CJ-7 is a breeze. It's controllable enough for the beginner and fun enough for the more experienced modeler. With the beach nearby, the dunes are perfect for playing in the sand and catching some rays.

Operating time with the kit-provided dry batteries was impressive, but some of the really large dunes and deep sand posed a problem. The next step was to

add the 6V/1.2-Ah battery pack for the extra punch I needed.

Along with the optional battery system Robby offers, they can give you a sharp lighting kit with rechargeable batteries for night-time driving. Order part No. 8279 for the working light and flasher kit. So, whether you want to hit the beach by day or night for a beach party, Robby can get you there.

Dressed up with lots of chrome, the Jeep CJ-7 is as realistic as they come. The kit's appearance package includes dual mirrors, fold-down windshield, chrome-spoke wagon wheels, heavy-duty chrome bush bumper, dual air horns, roll bar, and a sharp decal package as the finale. Simply get behind the wheel and be the envy of the crowd. Radio-controlled cars don't have to burn-up the pavement to provide you with hours of enjoyment.

*The following are the addresses of the companies mentioned in this article:

Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.

PIC—Penn International Chemicals, 943 Sterlin Rd., Mt. View, CA 94043. ■



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What's New



MONSTER BEETLE

This 1/10-scale electric-powered, radio-controlled, custom high-rise Volkswagen Beetle off-road buggy from MRC/Tamiya (Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817) rides on huge 130-mm diameter tires that are 60-mm wide. The semi-pneumatic rubber-like tires enable easy or rough terrain travel. Overall length of the Beetle is 410 mm, width is 290 mm, and height is 240 mm. Four-wheel-independent suspension with double-wishbone-type at the front and trailing-arm-type at the rear is dampened by four large-capacity adjustable oil-filled damper units. The ABS frame is light and tough. Differential gearing provides excellent cornering and maneuverability. High performance is assured with the competition RS-540S motor. The highly detailed injection-molded body can easily be painted with plastic paints.



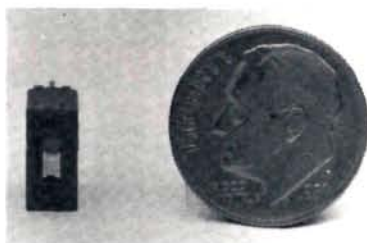
GMP BEARCAT

Gorham Model Products (23961 Craftsman Rd., Calabasas, CA 91302), R/C helicopter manufacturer and importer in the U.S., is now exclusively offering Hirobo's new line of R/C racing cars. Hirobo's new Bearcat is a tough new 1/10-scale rear-wheel-drive racing buggy. Fast and lightweight, its standard features include RS-540S motor, two-stage timing belt-drive, ski-type monocoque frame, Kydex front bumper, sealed transmission case, four-wheel semi-double wishbone front and rear suspension, and 10 mm diameter high-capacity oil shock dampers.



1/8-SCALE GAS SPRINT KIT

Moody Automotive (755 Ash St., Flossmoor, IL 60422) now offers a true 1/8-scale gas-powered sprinter called the American. Based on a proven dirt-track design developed over years, the all-metal kit comes completely machined and ready to assemble using your .21 model car engine and a two-channel radio. Special details include nickel-plated roll cage and nerf bars, sealed ball bearing, 6 1/4:1 gearbox, 4-coil spring suspension, aluminum-channel chassis, and all formed-ABS body parts, including wing and driver figure. Send \$1 for catalog.



MICRO-LIGHT RECEIVER SWITCH

Pro-Track's (P.O. Box 441, Elyria, OH 44036) newest product is the Micro-Light Receiver Switch. Weighing less than 1/2 gram makes Pro-Track's receiver switch the lightest available. It can be used with any make of receiver on both off-road and 1/12-scale R/C cars. Its features include gold-over-phosphor-bronze contacts with an electrical and mechanical life of over 10,000 cycles and a rated capacity of 100 mA at 50 volts DC. The positive detent slide actuator is vibration and shock proof. Mounting instructions are included.



TEKIN PEAK-DETECTION CHARGER

The Tekin (2411 S. El Camino Real, San Clemente, CA 92672) model 870 is a genuine no-nonsense peak-detection charger capable of charging a 4- to 7-cell battery pack. The 870 is designed to extract the maximum possible voltage and capacity from your batteries. Also in the Tekin lineup is the hot new BC200 Pro Charger. This is also a peak-detection charger that includes a digital readout. This will actually measure (in AMP minutes) the battery's capacity while charging with better than 95% accuracy. Other features include LSI circuitry and a double-deck PC board for compact size, volts/amps output jacks, and adjustable current from 1 to 4.5 amps. The BC200 is also capable of charging a 4- to 8-cell pack within the 250- to 1,200-mAh range. With all these features, it's easy to see why this was the charger of choice at the IFMAR World Championships. For more info, contact Tekin Electronics.



HELLO, KYOSHO

Great Planes Model Distributors is now carrying the new Kyosho Salute. It's identical to the race-proven Turbo Optima except for the futuristic style of its body and wing, giving it a maximum aerodynamic benefit. It's supplied without a motor so you can use any type you wish (the LeMans 240SB is recommended). The Salute has 16 precision, stainless ball bearings, Kyosho's low-

profile tires and large diameter wheels, four Kyosho Gold adjustable-pressure, oil-filled shocks, front and rear stabilizers, and a chassis guard plate.



Kyosho has also recently introduced the two-wheel-drive Plazma MK II, made mostly of magnesium for light weight. It features ball bearings, a coil-spring independent front suspension, wide, low-profile tires for maximum traction, a proportional speed control, and an ultra-low CG for optimal cornering. The LeMans 600E motor is included. The Plazma MK II also comes with the new aerodynamic KS-2 body with a rear wing to make the car stick to the road.



The Kyosho Cosmo is perfect for beginners and features four-wheel independent suspension, four oil-filled shock absorbers, an RS-540 motor and low-profile tires. Also included is the new Kyosho Racing Clutch which will increase running time and traction, and prevent damage to the motor should the wheels jam. An easy-to-follow instruction manual makes assembly easy. These products are distributed to leading retailers nationwide by Great Planes Model Distributors.

SPRINT CAR CONVERSION KIT

At last, an R/C oval sprint car that looks and handles like a full-size one. Convert your Associated RC10 to one of these oval track dynamos in a matter of a few hours. This conversion kit from American Racing Models (7933 Ingalls Ct., Arvada, CO 80003) contains every-



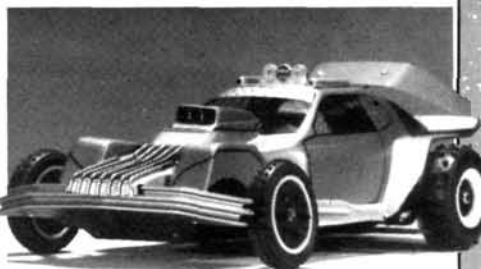
thing you need to turn the RC10 you're now racing into a dirt-spitting, broad-sliding oval sprinter. Features include durable T-6 aircraft-aluminum chassis and servo mounts, roll cage, kick-offs, rear bumper, driver, hood, tail, headers, and mounting hardware. This is not a complete car but a chassis conversion that combines sprint car design and technology with the proven durability and outstanding suspension components of the popular Associated RC10.

NEW FROM BOLINK

Who puts more fun into R/C cars? BoLink (420 Hosea Rd., Lawrenceville, GA 30245), with yet another classic 1/12-scale 1934 Ford Hot Rod (No. BL 2009). Available clear or painted, this body features side pipes and a molded-in hood scoop.



A 1/10-scale ASA-style Thunderbird (No. BL 2372 clear or No. BL 2372P painted) is the latest addition to BoLink's line of oval racing bodies, for the racer who wants good looks and fine handling characteristics.

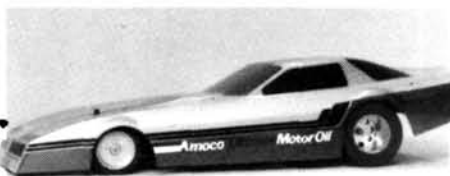


NEW FROM MRP

Storm the track and blow away the opposition with this 1/10-scale Dirt Warrior body (30-1132) from Model Racing Products (18676 142nd Ave. N.E., P.O. Box 647, Woodinville, WA 98072) on your favorite off-road car. Armed and armored to take on anything, this mean and nasty looking body is not for everyone, only motorized gladiators need apply.



The Ford Step-Side body (30-1118) will fit any 1/10-scale off-road car. A shorter overall length makes the body lighter, and better able to handle bumps and jumps. So now you have a choice of three pickup bodies: the Dodge Step-Side (30-1105), the Ford Styleside (30-1106), and the Ford Step-Side.



MRP also introduces its 1/8-scale Pontiac Dragster body (40-2330) with sleek styling from the latest aerodynamic funny car bodies of the full-size cars. Lightweight, clear Lexan is used for strength and good looks. This body is ready as a scale or performance 1/8 gas funny car. See all these new bodies at your local hobby shop.

Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Radio Control Car Action, nor guarantee of performance or safety by Radio Control Car Action. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Radio Control Car Action.

What's New



NEW FROM GTK

Applicator and formulated oil was designed for use on the commutator and all electric motors. From the time the motor is in operation until it stops, carbon deposits build-up on the commutator, robbing valuable rpm, resulting in power loss and causing excessive motor heat. When the applicator is installed and Formula Oil applied, it will restore maximum rpm, eliminate brush wear, prevent arcing and sparking, and remove power-robbing carbon from the commutator. Dust covers and motor parts don't have to be removed to apply this oil. When the applicator is installed, the Formula Oil creates a bearing surface on the commutator, which reduces friction and heat. For more info, write to GTK (908 Rd. 50, Pasco, WA 99301).



1/4-SCALE GRIZZLY

A tough reliable 1/4-scale, remote-control off-road vehicle, Grizzly is now being marketed by Pacesetter Products (930 West Hyde Park Blvd., Inglewood, CA). Grizzly is 37.5 inches long and 21 inches wide with a wheelbase of 25 inches. Designed with plenty of ground

clearance, it can tackle any kind of terrain. Its gasoline-powered, 2.3-horsepower Quadra engine (20:1, 40:1, with two-cycle oil) can exceed 65 mph. Machined aircraft-grade, aluminum-cast suspension arms and aircraft-grade tubular steel heli-arc-welded frame and roll cage are standard. Four-wheel-independent suspension and custom-made 70/30 oil-filled, adjustable, dampened shocks are standard. High-density, high-traction tires are fitted over spun-aluminum wheels. The lightweight Quadra engine has three main bearings and a built-in recoil starter. A Futaba pistol-grip wheel remote control, capable of guiding the vehicle up to a quarter of a mile away, is optional.



PIC PLASTI-STIC

From Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043) comes a sophisticated cyanoacrylate designed to bond all plastic kits and space-age composite materials with maximum integrity. Cuts through all release agents and doesn't attack or chemically soften plastic parts. Recommended for all plastic model kits. Won't damage hobby paints. Delivers maximum flexural strength when bonding composites. Proprietary chemistry doesn't turn brown with age.



FUTABA SERVO

The new S135S (S35S) servo from Futaba (555 W. Victoria, Compton, CA 90220) provides mini-size to operate and control the various functions of your model. Futaba provides servos with the size, power, and response necessary to operate almost any R/C kit. Specifications include a Futaba J-connector (3-pin mini connector) and 1520us (1310us) neutral. A coreless mini servo has metal gear/ball bearing output. Dimensions are 0.62x1.21x1.18 inches.



AUTO AND POWER PEAK

The Pro Shop (P.O. Box 5382, Parsippany, NJ 07054) introduces this Peak Detection Converter, a revolutionary concept in charging technology. The Pro Auto Peak, Peak Detection Converter is a small charger control module which instantly converts any DC fast charger (even charge cords) into a completely safe and automatic electronic peak-detection charger. It assures 100% full charge without the need to first completely discharge. With peak-detection charging, both power and run time are increased. Features include solid-state detection circuitry, LED indicator, built-in self-test routine, and automatic switch to trickle charge. This is an ideal way to upgrade your present charger to peak performance.

The Pro Power Peak 6- and 7-cell DC Peak Detection Charger is a self-contained, electronic peak-detection fast charger. Features include transistorized current regulation, pulsed LED indicator, 6- or 7-cell selector switch, and automatic switch to trickle-charge. It performs a self-test each time it is

(Continued on page 127)

RACE STRATEGY

(Continued from page 90)

Now let's chase this first-place car down and pass it:

You're close enough to see it in your wide-angle view. Now close up to within two or three car lengths. This does two things for you. It makes it much easier to see what the other car is doing and it makes the other driver nervous, consequently more mistake prone. Don't run nose to tail because if the driver goofs, his car will probably collect yours. Running

nose to tail also makes it difficult to keep your focus on your own car and you can be suckered into a crash.

If you get close and try to pass immediately you lose the advantage of the psyching. After all, the other driver can make a mistake and you can motor by without any danger to your car, so why not, since you have the time in this instance, tail him, find out how he's driving, and let him get nervous?

By following closely, you find your opponent is as fast down the straights as

you are, takes a good line through the turns, but can't take the jump as fast as your car can. You decide to pass at the jump but you don't want to give away the move before you're ready to use it, so follow the same line over the jump as the other car does and don't jump any better.

Let the laps wind down because the longer you dog the other car, the more likely he'll make a mistake. Also when you make your pass you don't want a lot of time left or he might work the same stuff on you! Anyone who has ever seen a NASCAR race knows this strategy.

As you approach the jump, and this time you're going to pass, don't give the move away too soon. Stay behind as you have in past laps until the last possible second, then make your move. Remember, you've already figured this is the only place you can get by and, if your opponent hasn't made any mistakes with you dogging him, you'll only get this one chance so make it good.

After you make this very satisfying pass, it's natural for your focus to diminish while you're congratulating yourself, so you have to fight to keep your focus sharp. Don't lose your concentration and give the lead back with a mistake. Keep your cool and hold that big grin until the race is over. If you keep yourself in control, you'll be number one at the finish!

In "Race Strategy, Part IV," I'll work on passing in heavy traffic and how to use other cars to help you make the pass, more psyching, and sizing up the competition.

See you at the track.

Dick Brinton, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897. ■

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STEERING LINKAGES'S

(Continued from page 54)

using plastic or worn metal bushings on the wheels. This play can be cured with a set of ball bearings. Another problem you might encounter is play in the suspension components.

This is a little more serious than the bearings, but a great number of aftermarket manufacturers have come up with a variety of replacement parts that will keep these cars competitive. For some help on the MRC Frog, check out Part II of the three-part series, "Project Frog" by Fred Murphy.

*The following are the addresses of the companies mentioned in this article:

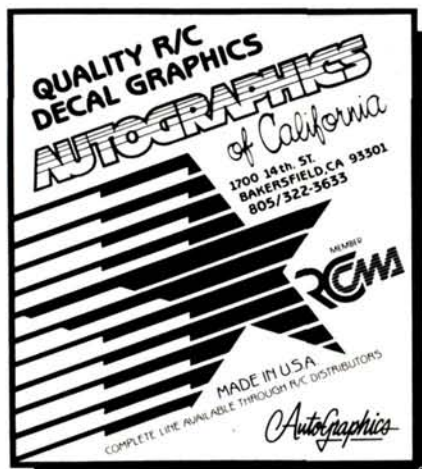
MRC/Tamiya, Model Rectifier Corporation, 2500 Woodbridge Ave., Edison, NJ 08817.

Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, IL 60084. ■

TOMCAT

(Continued from page 25)

different motor pinion cogs, and the kit includes adjusting keys to assist in getting the correct tension without fuss. A neat



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and novel idea.

Operation of the belt unit is incredibly quiet. Like its back-alley cousin, it can sneak up quietly on its prey. I'm afraid that if it's noise you're after, you won't get any from the Tomcat.

At the rear suspension, there are two large oil-filled dampeners mounted to the shock towers. Like the front dampeners, they're adjustable to spring tension and provide very good action. A camber-adjusting tierod attaches to both rear axles, allowing rear end trimming. Finally, there's an anti-roll torque bar which is not only ball-link mounted but adjustable as well. Standard dogbones connect the transmission to the wheels, where two square-shouldered, spiked tires are ready to do service.

The Tomcat is powered by a Mabuchi RS540 motor, protected by a rubber-boot dust cover, a nice touch. The rear end is fully enclosed by the rear of the roll cage, providing adequate protection from tail-gaters. The roll cage provides protection to the sides as well as the top of the car. A large plastic bumper wards off slow moving cars to the front—and don't worry, it works!

The body of the Tomcat is a polycarbonate unit, unpainted from the factory. A large driver figure, of the same material, is also provided. I used new Pactra* Race Finish paint to add color to an otherwise transparent body. This paint is easy to work with and covers quite well. Whatever you do, don't leave out the driver figure in the Tomcat as it provides dust

and dirt protection for the speed controller, and the car would look incomplete without him. An aerodynamic wing for the rear rounds out the body.

Now for the stats on the Tomcat. Overall length is 16 inches, width 9½ inches (at rear wheels), wheelbase 10¼ inches, and overall weight 35 ounces without battery but with the radio gear, it's a light machine. Overall time from box to track is only 2½ hours. Not bad.

PERFORMANCE. Driving the Tomcat held no surprises. It's a straight shooter, having good speed with the stock gearing and standard motor. The three-speed controller provides adequate control (with the stock motor) and very effective braking. We normally don't use a reverse in our stables but the Tomcat was not to be passed up. The reverse speed is a full-speed reverse, so beware.

Handling is very good, right from the box. The dampening was up to par, socking up the big bumps and leaps with no sweat. In fact, it was hard to get the car to leap from the smaller jumps because the suspension had taken the leap out of it, which tells you that taking the big jumps is a piece of cake for this kitten.

Left and right turns held no bad surprises as the Tomcat allowed good cornering ability with little tail sway; and the differential was doing a good job back there. If you want to feel a really smooth differential, try this one; it almost feels like there's nothing connected to the other wheel, but it is and you'd be hard pressed

(Continued on page 112)

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TOMCAT

(Continued from page 108)

to find a better one. Just think what this hummer will do if you stick a honking motor on it!

No doubt, this one lives up to its name—drives fast, is agile, and remains quiet enough to sneak up and pounce on the competition. The belt drive system works very well and provides good power transmission to the wheels. Add to this a good-working suspension and tough monocoque frame, and you have the workings of a stealthy off-road machine that's a great critter for keeping the pests away.

*The following are the addresses of the companies mentioned in this article:

Circus Hobbies, 3132 S. Highland Dr., Las Vegas, NV 89109.

Pactra Industries, 16946 Sherman Way, Van Nuys, CA 91406. ■

BRAT

(Continued from page 84)

back, but a pair of aluminum brackets was fabricated to mount them on the ends of the trailing arms in the vertical position. The original position, up near the

pivot point on the arms, would have had the shocks protrude into the equipment box, taking up a lot of room and making sealing a problem.

The neat feature on this design is the inclusion of jacking screws where the shock units mount to the chassis, allowing quick and accurate adjustments to compensate for changing track conditions or to alter the handling characteristics, just like a full-scale stock car. Strategically located holes in the body allow these adjustments to be made without removing the body. The basic part of these jacking screw assemblies is self-locking captive nut devices bolted to the chassis; their nylon inserts keep the long screws from turning by themselves and common wheel collars act as the retainers at the top of the shock. The nuts over and under the collars are just loose enough to allow the collar to swivel. They are secured to the bolts with thread-locking compound.

To arrive at the initial chassis setup, the car should have about an inch of ground clearance; less is required if the track is smooth. The springs should be soft enough to give adequate suspension movement but hard enough to prevent

bottoming out. Four hard, square-profile spiked tires generally give the best results, with the fronts as wide as the rears, if possible. With everything in place, slip the clear body over the completed chassis and mark all of the trimming lines with a china-marker (grease pencil). After the bottom is trimmed and the wheel wells are cut open, you can cut or drill the mounting holes and, if desired, the access holes for the jack screws. I used stock Brat/Frog body mounting posts screwed into the front and rear crossmembers. With the body secured in position, make sure you check tire clearance on the body at full suspension travel, and with the front wheels turned left and right. If you don't do this right, and you hit just the right bump in a turn, the spikes on the tire could touch a fender and lock-up a wheel, with a spin-out resulting.

You can use your own methods for painting the Lexan body, but my way works, and I'll explain it. First, scuff up all interior surfaces except the windows with Scotch Brite abrasive pads. Note that this is all done *after* the trimming is completed; it's easier to get a good fit and do a

(Continued on page 114)

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BRAT

(Continued from page 112)

good trimming job before the body is painted. Mask off the windows and any color separation lines with tape (I use masking tape strips cut on a sheet of glass to give a clean edge). The choice of paint is up to you, as several brands of Lexan-compatible paint are available. I've used Floquil brand paint and automotive lacquers, thinned for spraying in an airbrush, and with a flex agent added to keep the paint from becoming brittle. This is the stuff body shops use to paint the flexible front and rear pieces on late-model cars. On this model, however, I tried regular Tamiya acrylic paint (not the car formula), thinned half-and-half with their thinner, and it seemed durable enough on some test samples that I tried.

I normally do my painting outdoors to keep my landlord from getting unhappy with the fumes, but there is almost no odor with the Tamiya paint and I could use it inside in the cold weather. The graphics were hand-cut from Top-Flite* MonoKote trim sheets, after first making a stencil. The pattern is transferred to the back of the sheet with carbon paper, or very painstakingly cut from the front with an overlay pattern and a brand-new X-Acto blade. You can decorate your car in just about any color as the MonoKote sheets are available in many hues, and one inexpensive sheet will do several cars. I keep a supply on hand of several colors, especially the chrome. The small decals were acquired from several Auto-graphics* sheets.

Now you're ready for the fun part—setting up this beast. We are assuming, of course, that you'll be running an oval track with left-hand turns only. If you started with a Frog, take out the differential and put it with the rest of the extra parts, and obtain the equivalent Brat "locked" rear parts. A differential is not appropriate in oval track racing. Mount the steering servo in front of the box, between the front suspension mounting pieces. You may have noticed that I didn't use a servo-saver; I merely hooked the steering rods to the customized servo wheel. I can't say that you don't need one and won't break a servo if you stuff the car into a wall, but I've always found that the big bodies do a good job of protecting the wheels, and even in hard wrecks the ball links pop off of the steering arm first.

The speed control is the stock Brat part and is bolted to the right side, inside the box, with the servo taped in place behind it. The twin resistors are mounted to the outside of the box, behind the right front wheel, with the wires routed through a small hole. Temporarily wrap the receiver and radio battery pack in foam rubber, and devise a method to secure the Ni-Cd battery pack in place. Several holes drilled in the floor, with a couple of rubber bands through them, will hold down the battery, and extra holes will allow you to shift the battery around. Cover the unused holes with pieces of masking tape to keep dirt out. A piece of duct tape or a piece of plastic bag material and some masking tape can be

used to seal up the open area around rear suspension and motor mount. The top cover can be friction-fit in position.

The Ni-Cd pack should be positioned crosswise in the middle of the box against the left side. This will be the baseline position for initial track tests. Temporarily tape the receiver to the back of the Ni-Cd pack, and the radio battery pack to the floor in front. If you're using a battery eliminator, this will save weight. Set all of the jacking screws to the off position, and make sure everything is tight. You may need an antenna mast, depending on your radio, but I've been successful with running the antenna wire around the perimeter of the chassis, wrapping it around the body mounting posts below where the body rests. Check everything out and head for the track, which is the only place to set it up.

Begin testing by taking a few laps at slow speeds to get used to driving the car. Gradually work up to a full-bore pass down the straightaway and drive it hard into a turn, observing the reaction. If it "pushes," or tries to go straight, you'll have to shift some weight to the rear by relocating the Ni-Cd pack. If it's "loose," or tries to spin out, you'll have to shift the battery forward. Move it only a little at a time, and keep trying it out. As you get more confidence and get the car handling better, it will be going faster and cornering harder, possibly requiring further changes. You might even try turning the battery so that it sits fore-and-aft, and

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move it progressively more to the left side. Cornering becomes impressive, but there are limits to everything—with a lot of the weight to the left, the car will flip over or spin radically if you have to cut right to avoid a wreck. By the way, if you think I put too much emphasis on weight, check the rules for the real oval-track racers—the distribution percentages are rigidly enforced! The intended final result should be that the car will corner with just a slight push, at full throttle. It might look neat if you've got it cornering with it a little loose, but if you have to let up on the throttle or somebody bumps you, you're going to spin out. If you've got it close, you can start making adjustments with the jacking screws. A couple of turns on the right front should tighten it up a little, while a few on the left rear will let it corner a little easier. You might even want to try some tire tricks at this point; a slightly larger tire on the right rear will "stagger" the rear end to help the car turn left. You'll have to play with the jacking bolts to keep the car in a straight line on acceleration but as long as you don't go nuts with the stagger, it won't be a

problem. Generally speaking, the tighter the turns are, the more stagger you should have. And bear in mind that we're talking about fractions of an inch.

If you really like playing with this sort of thing, a worthwhile investment is a set of scales. I use four inexpensive letter-type postal scales (all the same) of 2 pound capacity. Now you can record the weights on each wheel and then change it back to a particular setting if something you did doesn't work. Make only one change at a time between tests so you can see how it works, and try to get a friend to time your laps. Record your "hot" setups at different tracks, and eventually you'll be able to set up the car before you leave home. You can even mount up a set of pavement tires or slicks and put on some stiffer springs to try on paved tracks. If you're going to run a road course, you'll have to center the side-to-side weight bias and start all over again.

Well, you've got the wings—now it's up to you to do the flying! And don't be chicken about improving the bird, you can always go back to the egg and then re-hatch.

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Top Flite Models, Inc., 2635 South Wabash Ave., Chicago, IL 60616.

Autographics of California, 8536 Kern Canyon Rd./169, Bakersfield, CA 93306. ■

PUMA

(Continued from page 75)

This makes for a lot of smoke as the tires melt but precious little action!

Some notes are in order. Page 4 shows the front differential (and suspension) as viewed from the forward position; page 5 shows the rear differential from an aft position. The holes for screws to hold the differential case cover in place were not drilled. Do not try to set the required self-tapping screws in place without drilling pilot holes. The differentials came assembled but required lubrication before installation. I partially filled the diffs with gear oil and slid the closure in place. I understand that the 1987 version of the Puma comes with both differential cases

fully assembled, which will relieve you from any of the above. However, if you pick up an older Puma model at your hobby shop you'll have to keep it all in mind. Some parts, such as FP-206, have slight machining ridges and must be relieved to fit properly. Any removal of these edges can be easily done with an X-Acto knife blade or fine jewelers file.

An Enya 21 CX was selected for power and was run-in on a propeller for a half hour or so—a good move since engine operation in a car is heavy-duty work with little cooling air going past those fins. Break-in is wise for any buggy engine to avoid overheating conditions early in its life.

In order to set the centrifugal clutch properly, about $\frac{3}{16}$ inch must be cut from the engine's shaft since the holding component (FP-232) bottoms before it grips tightly. This modification to the engine shaft can be done with a Dremel cut-off disc. Be sure to wear safety glasses when you do this.

There is a wide latitude available in setting the engine on its mounting blocks which permits adjustment of the engine output to the car shaft main gear. Proper adjustment is the distance provided by a

piece of bond paper as shown. When everything is in happy compliance, really sock down (and use a thread lock) the upper and lower engine-mounting screws. There is a lot of torque generated into relatively unyielding gears and this can loosen things up in a hurry.

Unfortunately (for me), the car calls for the use of an engine with a lateral slide valve carb; my Enya had a more usual rotary valve. This necessitated a linkage change from servos in the equipment box (which, by the way, is great—dust- and waterproof) to the engine and brake. I finally solved this by mounting one servo in each cavity with receiver in one and battery pack in the other. You'll have to give the linkage some thought when you decide on your engine. Remember to fit some foam rubber in the equipment box to suppress vibration; a fact of life in gas-powered cars.

All wheel angles were set up as suggested on page 14 of the instruction manual. Some modification can be accomplished by varying the shock position and the spacer washers. What is shown, however, seemed very satisfactory. I used a slight bit of toe-in and the suspension

(Continued on page 120)



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PUMA

(Continued from page 116)

setting was as the parts and instructions led me.

The disc brake adjustment is a little fussy to come by and the instructions give little help. I used a drive rod of 1/16-inch music wire and a couple of wheel collars to provide drive and return for this function. By adjusting space between the two collars I was able to get reasonable brake

function.

The tank on this car is purpose-designed and works extremely well. It feeds fuel in any position this car can get into and the quick-fill, spring-loaded cap is a neat feature.

When completed, the car weighed in, with fuel, at 7 pounds, 14 ounces; far more than the typical electric car. Don't let that deter you—with that screaming .21, 7 pounds-plus is no problem. By the

way, the Puma kit contains a large expansion muffler to suppress its snarl. The car carries roughly half its weight on each suspension extreme. That 50% balance is probably part of the car's overall steering stability and dirt-digging drive.

I've used Enya engines in both airplanes and cars for many years. They are quality built and exhibit a tendency to run and run for years. This Enya 21 CX is no exception, after several hours of running it is just as new. The engine starts easily and maintains its adjustment over a wide variety of conditions—particularly the idle, an important requirement in gas cars. There is a small lever on the car that is used to establish a finite idle setting and, once properly set, it holds its setting over a wide variety of conditions. What a driver looks for is a solid low idle with smooth transition (very little lag or sloppy response) to full power. Along with that the engine must be able to drop a bit lower when the brake comes in and causes a bit of additional drag. At this low level, it must remain running and still come back to high cleanly. Of course, once the centrifugal clutch completely

(Continued on page 123)

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courtesy of MRC/TAMIYA

PUMA

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disengages, the brake drag has no effect on the engine.

I've spoken of the Airtronics* pistol-grip radio in the past. It has been in three or four cars of mine and continues to perform flawlessly. Its various end point, dual rate, and exponential and reversing adjustments make set up very easy. And I sure do like that wheel control for steering. After battering that Airtronics radio around for many hours I can say their products are certainly worthy of your consideration.

PERFORMANCE. My first try at running the Puma was a disaster. Because I had waited for a helper for two days I finally decided to go it alone. And that is possible if you get the proper grip on the car and bump-start the engine from the under rear. Don't try to simply hold an electric starter on the knurled flywheel—it won't work. Simply get the starter up to speed and tap it against the flywheel; that's a "bump" start.

Finally I had a start and that Enya was screaming! I set down the Puma and that Enya was screaming. The Puma didn't go anywhere! After shutting it down I de-

cided I had the pawls of the centrifugal clutch incorrectly installed. That proved to be very wrong. Back to the road!

A quick start and that Enya was once again screaming. I set the car down and immediately tripped—fell on the Puma (it's strong) and had a real mess on my hands; or more correctly, on my knees. Basic moral to this story, always have a helper; it helps!

After staggering to my feet, bloody knees notwithstanding, that car sat there, screaming and smoking. "Now what?" I mused in my new-found agony.

Well, of course, the "now what" proved to be a realization finally that the wheels were driving against each other. It was the aforementioned and incorrect installation of the FP-206 ring gears. For the moment, the two rear T-bone shafts that provide the rear-wheel drive were removed and Puma was run, at last, as a front-wheel-drive, front-wheel-steering car. It ran fine until one wheel spun off, ending the first test efforts.

That brings up my final tip. I strongly suggest you grind a flat area in each axle to better set the wheel hub (FP-204) on

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(Continued on page 130)

PUMA

(Continued from page 123)

the wheel axle. A flat is shown on the drawing but isn't on the actual part and it's really needed.

Back in my workshop I redid the rear differential (not a particularly difficult job) putting the ring gear in its proper position and placing those axle flats I suggested.

With everything right, the Puma began to snarl.

Running tests showed it to be all I had expected. This animal digs along in sand, mud, or flats with plenty of speed and it steers the tightest turns with little tendency to spin out. I doubt the car can be turned over in normal running. Numerous runs showed I had finally killed all the "bugs"; most of them were of my own making, but better instructions would have kept them from my door.

There are optional tire spikes available and they are well worth adding to the car. The spikes really dig in any kind of loose material—sand, dust, or snow. I added the spikes after several hours of running and they make handling quite different. On any typical off-road surface, the digging ability of the studded tires really make a

major difference. A caution, however, don't get your hands anywhere near the tires when the wheels are spinning; they can turn anything that is flesh into instant hamburger!

Turns have virtually no slide with the studs; power up is a positive, no-lag situation; steering becomes very solid. Indeed, with the spikes you might want to turn down the steering angles a degree or two. Spiked tires have no advantage on smooth surfaces; but, how often does your off-roader see anything very smooth?

By the way, the 1987 version of the Puma Pro 21 XL now includes a Lexan road body that further enhances the car's versatility. Also new for '87 are six shocks rather than four.

The Puma is a solid, fast-running gas off-roader with lots of versatility. It's no beauty (really something out of *Road Warrior*) but what it lacks in glamour it makes up for in solid performance. Except for tripping over my two left feet, I truly enjoyed F.P.'s Puma and I expect a lot of hours of further enjoyment. The Enya 21 CX is a great buggy engine and that Airtronics radio is as good as they come.

Try a gas car—you'll enter a whole

new world! I did.

*The following are the addresses of the companies mentioned in this article:

CMW International, 2101 Midway Rd., Suite 250, Carrollton, TX 75006.

Altech Marketing, P.O. Box 286, Fords, N. 08863.

Airtronics, Inc., 11 Autry, Irvine, CA 92718. ■

PROJECT FROG

(Continued from page 81)

millimeter ball bearings to the front wheels before mounting.

If the aforementioned wheels and tires aren't satisfying enough for you, try a Pro-Line Baja-Bug body to top off this bestial undercarriage; the body can be mounted using the Parma Frog adjustable body mount kit No. 10451.

PERFORMANCE. With the transformation now complete, the laboratory door creaks open to see how far this bullfrog can leap....

With batteries loaded and the track clear, this cold-blooded competitor kicked up dirt everywhere—and with lightning speed. The modified marsh-dweller has unlimited power reserve and speed, not to

mention its remarkable ability to leap great distances. The beefed-up suspension and drive train give the creature its ripping teeth. To give you an idea of this predator's performance, the local facility has a 4-minute record (set by an RC-10 in '86) of 23 laps and this Project car, with no adjustments, made 22 passes by the start/finish line. We're not far off and I'm sure that with minor adjustments and a little time in the driver's stand, Project Frog will begin its reign of terror! Ahh-hah-hah-hah. Hmmm.

But stay tuned, we're not yet finished with the experiments...and right now Project Frog Part III is being master-minded down in the laboratory, where we'll prove that a Frog can be changed into a prince!

**The following are the addresses of the companies mentioned in this article:*

MRC/Tamiya, Model Rectifier Corp., 2500 Woodbridge Ave., Edison, NJ 08817.

Thorp Manufacturing, 380 S. East End, Unit H, Pomona, CA 91766.

CRP, Custom Racing Products, 3250 El Camino Real B3, Dept 6-F, Atascadero, CA 93422.

Parma International, Inc., 13927 C Progress Pkwy., North Royalton, OH 44133.

Pro-Line, P.O. Box 456, Beaumont, CA 92223.



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Special thanks to WIZARD MOTOR RACING TEAM for using the CM10 and the new CMW Peak Detection Pulse Charger at the JG Westcoast Championship.

*Team-mate Rob Cutman (PA) took A Main 2nd.

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*1/2 price special (ends May) CM10 \$59 CM12 \$44 Pulse Charge \$39.50

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RPS, Ranch Pit Stop Distributing, 1655 Mission Blvd., Pomona, CA 91766.

POLE POSITION

(Continued from page 39)

ing. Ground effects are not permitted in the Stock or the Modified, but they are legal in the Open class. Here is another way to balance out the two-wheel drive versus four-wheel-drive cars: permit only the two-wheel-drive cars to use ground effects.

All races call for 4-minute heats. It seems like this could easily be stretched to

5 or 6 minutes. Mechanical and/or front wheel brakes would be allowed on Open cars. I don't think there is any need to introduce brakes to 1/10 electric cars. It would only add both expense and complexity.

No moving aerodynamic devices are allowed in any class. There should be some flexibility here for moving skirts on ground effects two-wheel-drive Open cars. The key should be to not allow remote-controlled moving aerodynamic devices on Open cars.

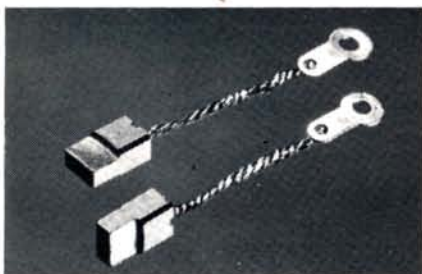
Electronic speed controls are only legal

(Continued on page 129)

What's New

(Continued from page 104)

connected, which assures that everything is connected and operating properly before a battery is charged. The Pro Power Peak comes complete with auto battery clips and Tamiya connector. These products are available from your local dealer or The Pro Shop.



NEW FROM PARMA

Parma's (13927 Progress Pkwy., N. Royalton, OH 44133) cut brushes, No.



3578, tune-up Yokomo and Kyosho motors by reducing the friction on the commutator. This in turn allows for higher rpm and less amp draw.

Parma's latest 1/10-scale body, No. 10234, is the classic 1957 Chevrolet. Available in clear Lexan, it sets the standard for detail and realism.

Parma's Chevy stepside 1/10-scale body, No. 10200, is available in clear Lexan and is a perfect replacement for the Tamiya Blackfoot. It also fits most other cars with the use of a Parma body mount kit and is the perfect body for the new heavy metal class.



Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Radio Control Car Action, nor guarantee of performance or safety by Radio Control Car Action. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Radio Control Car Action.

POLE POSITION

in Modified and Open classes. That should help cut costs for the Stock class drivers.

In my opinion, the proposed weight rules are the biggest problem. The Stock class is limited to 45 ounces at the end of the race. Modified class is 41 ounces. Open class has no restrictions on minimum weight. My suggestion is to leave the Stock class at 45 ounces, but make the Modified class also 45 ounces, with a 7-cell battery pack. The Open class should also have a minimum weight, or somebody will simply buy the class title with a 25-ounce, four-wheel-drive, \$3,000 road rocket. Open class two-wheel-drive cars should weigh 42 ounces and four-wheel-drive cars should weigh 44 ounces.

All in all, R.O.A.R. has done a good job of regulating our sport. I'm sure the manufacturers will appreciate having these guidelines to study as they plan new cars for us to race.

Sponsored Drivers

There's been a lot of talk about factory-sponsored drivers and their advantages. It's true some drivers get a free ride from sponsors, but many manufacturers have agreed to a limit of 25 drivers in 1/12-scale racing. Not all manufacturers even have their full 25-driver allotment.

Technically, if a factory gives a driver anything, then that driver is sponsored. Obviously, not all drivers are sponsored at the same level. If a factory helps a driver out at a race, say they give him a set of tires, he's not considered a sponsored driver. I don't agree that all sponsored drivers should be considered professionals, and just race against each other. But, at the national level, it would be nice to restrict factory sponsored drivers to a single class of cars, say Open or Modified. This class would be open to other drivers also, but every driver at a national event should be restricted to racing in only one class. Once again, it would be nice to see some other names as national champs.

Besides factory sponsorship, other avenues are open to the average racer. If your races draw spectators, your car can be a billboard just as easily as Ricky Rudd's #15 Motorcraft. I know drivers who've been sponsored for \$25, \$50, or even \$75 in a single season. I heard of one team which brought in \$200 in sponsorship for one season of 1/12-scale racing.

You can provide a business with very inexpensive advertising; you just have to look for a sponsor. Take a couple of photographs of spectators who are watch-

ing your race. Next, paint up and mount a new body on your car, then letter one side with the name of your prospective sponsor. Try to use his color scheme. Take the car and photographs, along with a printed or typed race schedule, and visit the sponsor. Make the best deal you can, but be sure to give your sponsor the most exposure you can. If your sponsor has T-shirts with his company logo on them, wear one on race days. You might even have a good photo taken that your sponsor can display in his business. Let your sponsor know how you do in major races

or season points standings.

Rich Hemstreet, c/o Radio Control Car Action, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

BoLink RC Cars, 420 Hosea Rd., Lawrenceville, GA 30245.

D&D Graphite, Composite Craft, 2400 Sand Lake Rd., Orlando, FL 32809.

MRC/Tamiya, 2500 Woodbridge Ave., Edison, NJ 08817.

Model Racing Products, 18676 142nd Ave. NE, Woodinville, WA 98072. ■ •

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